Calendar No. 144

102D CONGRESS *1st Session*	SENATE	REPORT 102-97

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, FISCAL YEAR 1992

Mr. HOLLINGS, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

OF THE

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ON

H.R. 1988

JULY 2, 1991—Ordered to be printed

Filed under authority of the order of the Senate of June 24 (legislative day, June 11), 1991

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, FISCAL YEAR 1992

JULY 2, 1991.—Ordered to be printed

Filed under authority of the order of the Senate of June 24 (legislative day, June 11), 1991

Mr. HOLLINGS, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

[To accompany H.R. 1988]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (H.R. 1988) to authorize appropriations to the National Aeronautics and Space Administration for research and development, space flight, control, and data communications, construction of facilities, research and program management, and Inspector General, and for other purposes having considered the same, reports favorably thereon with an amendment in the nature of a substitute and recommends that the bill as amended do pass.

PURPOSE OF THE BILL

The purpose of the bill is to authorize appropriations to the National Aeronautics and Space Administration (NASA) totalling $14,994,500,000 for fiscal year (FY) 1992 as follows:

	Budget request	Committee authorization
Fiscal year 1992:		
Research and development	$7,198,500,000	$6,582,000,000
Space flight, control, and data communications	5,608,300,000	5,535,300,000
Construction of facilities	480,300,000	430,300,000
Research and program management	2,452,300,000	2,432,300,000
Inspector general	14,600,000	14,600,000
NASA authorization	15,754,000,000	14,994,500,000

	Budget request	Committee authorization
Previous authorization (P.L. 101-611), as amended		263,000,000
Total NASA program level	15,754,000,000	15,257,500,000

The bill also authorizes funds for the National Space Council and the Department of Transportation's (DOT) Office of Commercial Space Transportation (OCST).

Background and Needs

Last year, following detection of a design flaw in the $1.6 billion Hubble Space Telescope and a series of hydrogen fuel leaks that grounded the fleet of space shuttles, public confidence in NASA and the civil space program began to erode. In response, the Vice President, acting in his capacity as Chairman of the National Space Council, directed NASA to create the Advisory Committee on the Future of the U.S. Space Program (the so-called Augustine Committee).

In its report, the Augustine Committee identified a number of concerns relating to specific programs, funding levels, and management of the civil space program. It concluded that our future civil space program should consist of a balanced set of five principal elements: (1) a space science program, which the Advisory Committee concluded should be NASA's highest priority; (2) a Mission to Planet Earth, focused on environmental measurements, which the panel recognized as having "some degree of urgency"; (3) a Mission From Planet Earth, with the long-term goal of human exploration of Mars, preceded by a modified Space Station which emphasizes life sciences, an exploration base on the Moon, and robotic precursors to Mars; (4) a significantly expanded technology development program closely coupled to space mission objectives, with particular attention to engines; and (5) an evolutionary, unmanned, but manratable that is, capable of carrying safely spacecraft piloted by humans, heavy-lift launch vehicle.

The Augustine Committee also recommended that NASA's budget grow at an annual rate of 10 percent after inflation. However, in recognition of possible funding constraints, it also recommended that space exploration activities, including future missions to the Moon and Mars, be pursued only when funding is available, or on a "go as you pay" basis.

At the same time, the President and Congress agreed to the Budget Enforcement Act of 1990, limiting growth in Federal spending for all categories of programs. In recognition of this constrained fiscal climate, the conference report accompanying the FY 1991 VA, HUD, Independent Agencies appropriations bill (House Report 101-900), directed NASA to restructure the Space Station Freedom Program. Specific direction was given to NASA to develop a plan that reflects an incremental approach, with each phase to be discrete and independent of the next phase. NASA also was instructed that the first phase of space station development should be devoted to microgravity materials science research, followed by life sciences research.

In March 1991, NASA submitted its redesign proposal to Congress. The new plan calls for the space station to reach man-tended capability in FY 1997 and permanently manned capability in FY 2000. Certain capabilities planned for the space station either were deleted or were deferred to reduce overall program cost, which NASA estimates will be $30 billion through FY 2000.

In this context, the President's FY 1992 budget request for NASA was developed and submitted to Congress. NASA is seeking a total of $15,754,000,000, for the coming fiscal year, an increase of $1,886,000,000 (13.6 percent) over its FY 1991 operating plan of $13,868,000,000. Of the requested amount, NASA has stated that 99 percent is needed to fund ongoing programs—including the Space Station Freedom, the Space Shuttle, space science research, and aeronautics, among others.

In developing and considering the NASA reauthorization bill, the Committee has attempted to implement the broad recommendations of the Augustine Committee within the limitations of the 5-year budget agreement. However, given the parameters of last year's budget agreement, the Committee has serious concerns about the availability of funds needed to support all of NASA's ongoing and proposed programs. While there is strong support for much of NASA's budget request, potentially reduced allocations to the Appropriations Subcommittee in the Senate that funds NASA necessitates a prioritization within the authorization bill of the civil space programs by the Committee. In this regard, the reported bill attempts to preserve a balanced, viable space program with the necessary core capabilities.

Legislative History

On February 27, 1991, the President submitted to the Congress his FY 1992 budget request for NASA. Three hearings were held by the Subcommittee on Science, Technology, and Space on the budget request and related policy matters. The first hearing on April 16, 1991, reviewed NASA's plan to restructure the Space Station Freedom Program. At its April 19, 1991 hearing, the Subcommittee received testimony from the Chairman of the Advisory Committee on the Future of the U.S. Space Program on its findings and recommendations, as well as the NASA Administrator (administrator) on the agency's budget request and its response to the Advisory Committee report. At its April 24, 1991 hearing, the Subcommittee examined NASA'S space science programs, focusing in detail on the Mission to Planet Earth programs. These hearings provided the Committee with a better understanding of how the proposed budget would affect specific programs and the priorities of the civilian space programs in general.

On March 22, 1991, Senator Gore introduced, by request, S. 778, a bill to authorize appropriations for NASA for FY 1992 that encompassed the administration's budget proposal. S. 778 was cosponsored by Senators Hollings and Akaka. On May 2, 1991, the House of Representatives approved H.R. 1988, a bill authorizing funds for NASA programs for FY 1992-94. H.R. 1988 was referred to the Senate Committee on Commerce, Science, and Transportation.

On May 14, 1991, the Committee met in open executive session to consider an amendment in the nature of a substitute to H.R. 1988. After adopting an amendment by Senator Bryan to delete the $14,500,000 included to support the Search for Extraterrestrial Intelligence (SETI) program, the Committee ordered the substitute amendment reported by voice vote without objection and subject to technical amendment. The bill, as reported, includes language authorizing appropriations for FY 1992 for NASA, DOT's OCST, and the National Space Council.

Summary of Major Provisions

For FY 1992, the bill, as reported, provides a total of $15,257,500,000 for NASA (including $14,994,500,000 in new authorizations and $263,000,000 in funds previously authorized for the Comet Rendezvous Asteroid Flyby (CRAF) and Cassini missions), $5,104,000 for DOT's OCST, and $1,491,000 for the National Space Council.

TITLE I—NASA AUTHORIZATIONS

Of the $14,994,500,000 authorized for NASA, $6,582,000,000 is authorized for programs funded under the research and Development account, $5,535,300,000 for Space Flight, Control, and Data Communications, $430,300,00 for Construction of Facilities, $2,432,300,000 for Research and Program Management,and $14,600,000 for the activities of the Inspector General.

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION NASA BUDGET SPREAD SHEET FOR FISCAL YEAR 1992

[By fiscal year, in millions of dollars]

	1991 operating plan	1992 request	Proposed 1992 Senate authorization	Comment
I. Research and Development	6,023.6	7,198.5	6,582.0	
1. Space Station	1,900.0	2,028.9	2,028.9	
2. Space Transportation Capability Development.	602.5	879.8	704.8	
Spacelab	129.3	150.2	−10.0	Defer hardware replacement.
Upper Stages	82.2	108.5	−20.0	Reduced Centaur funding needed.
Engineering and Tech. Base	208.5	235.2		
Payload Ops. and Sup. Equip	101.5	144.5	−15.0	Delay support equipment.
Advanced Programs	35.2	53.8	−15.0	Reduce NLS work.
New Launch System	23.9	175.0	−125.0	Retain money for engine tech. development/launch vehicle.
Tethered Satellite System	21.9	12.6		
Launch Technology Program			+10.0	Initiate component tech. for commercial vehicles.
3. Space Science and Applications	2,427.6	2,934.6	2,560.1	
A. Physics and Astronomy	973.1	1,140.6	1,128.6	
Global Geospace Science	96.6	65.3		
Advanced X-Ray Astrophysics Fac.	101.2	211.0		
Payload and Instrument Dev	92.6	115.9		
Shuttle/Spacelab Payload Mgt	88.8	88.0		
Explorer Development	99.8	107.9		
Mission Operations and Data Analysis.	313.3	388.4		
Research and Analysis	100.8	103.1	−12.0	

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION NASA BUDGET SPREAD SHEET FOR FISCAL YEAR 1992—Continued

[By fiscal year, in millions of dollars]

	1991 operating plan	1992 request	Proposed 1992 Senate authorization	Comment
Suborbital Program	55.0	61.0	.....	Reduce OSL/SIRTF mission studies.
B. Life Sciences	138.0	183.9	144.4	Reduce Lifesat, Moon/Mars R&A, with no money for SETI.
C. Planetary Exploration	465.7	627.3	299.3	
Mars Observer	78.5	54.4	.....	
CRAF/CASSINI	145.0	328.0	.....	Previously auth. (PL 101–611) —$65 million (to $263 M).
Mission Ops and Data Analysis	170.2	150.5	.....	
Research and Analysis	67.8	93.2	.....	
D. Earth Sciences	662.3	775.6	780.6	
Earth Observing System	155.0	253.4	.....	
EOS Data Information System	36.0	82.6	.....	
Earth Probes	54.7	68.2	.....	
Upper Atmosphere Res. Satellite (UARS).	62.0	18.2	.....	
Ocean Topography (TOPEX)	76.0	51.9	.....	
Payload and Instrument Dev	46.1	48.6	.....	
Applied Research and Data Analysis.	232.5	247.7	+5.0	Purchase Landsat data.
E. Materials Processing in Space	102.3	125.8	125.8	
F. Communications	50.5	39.4	39.4	
G. Information Systems	35.7	42.0	42.0	
4. Commercial Programs	88.0	150.0	150.0	
5. Aeronautics Research and Technology	512.0	591.2	591.2	
6. Space Research and Technology	290.4	421.8	354.8	Reduce Exploration Tech and Explor. Mission Studies.
7. Transatmospheric Research and Technology.	95.0	72.0	72.0	
8. Safety, Reliability, and Quality Assurance.	33.0	33.6	33.6	
9. Tracking and Data Advanced Systems	20.0	22.0	22.0	
10. Academic Programs	55.1	64.6	64.6	
II. Space Flight Control and Data Communications.	5,124.4	5,608.3	5,535.3	
1. Space Shuttle Production/Operations Capability.	1,276.4	1,288.9	1,338.9	
Orbiter Operational Capability	275.6	273.8	.....	
Launch and Mission Support	253.0	270.1	.....	
Propulsion Systems	747.8	622.7	+50.0	Transfer from CofF for ASRM; ASRM authorized at $375 M.
Assured Shuttle Availability	.....	122.3	.....	
2. Space Transportation Operations	2,790.0	3,023.6	2,945.6	
Flight Operations	801.5	912.5	−78.0	Shuttle efficiencies; Launch TDRS–G on Shuttle.
Flight Hardware	1,393.3	1,417.0	.....	
Launch and Landing Operations	595.2	694.1	.....	
3. Expendable Launch Vehicles	229.2	341.9	329.9	Reduced Titan IV needs.
4. Space and Ground Network, Comm. and Data System.	828.8	953.9	920.9	General reduction.
Space Network	310.1	347.9	.....	
Ground Network	260.7	291.7	.....	
Communications and Data Systems	258.0	314.2	.....	
III. Construction of facilities	497.9	480.3	430.3	Transfer to Shuttle Prod.
IV. Research and Program Management	2,211.9	2,452.3	2,432.3	General reduction.
V. Inspector General	10.5	14.6	14.6	
NASA authorization	13,868.3	15,754.0	14,994.5	

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION NASA BUDGET SPREAD SHEET FOR FISCAL YEAR 1992—Continued

[By fiscal year, in millions of dollars]

	1991 operating plan	1992 request	Proposed 1992 Senate authorization	Comment
Previous CRAF/Cassini auth., as amended			263.0	
Total NASA program level, 1992			15,257.5	

Space Station—The reported bill provides $2,028,900,000 for development of the Space Station Freedom, which represents full funding of the President's request. The Committee believes that continued development of the Space Station is essential, as it will ensure continued leadership by the United States in space.

Space Transportation Capability Development—The Space Transportation Capability Development budget is $704,800,000, which is $175,000,000 below the President's FY 1992 budget request. This funding level will support continued development and operation of the Spacelab systems, procurement of upper stages required to place satellites in high altitude orbits, definition and preliminary development of improved propulsion and launch vehicle technologies, development and flight certification of the Tethered Satellite System, initiation of a technology development program to enhance the competitiveness of the U.S. commercial launch industry, and the engineering and technical base support at NASA centers.

The reported bill reduces the President's request for funds to initiate development of the New Launch System, a joint NASA/Department of Defense (DOD) initiative to develop a new unmanned expendable launch vehicle (ELV). Of the original $175,000,000 request for the New Launch System, the reported bill provides $40,000,000 for continued engine technology development and $10,000,000 for launch vehicle design studies.

The bill makes other changes to the Space Transportation Capability Development budget request, including a reduction of $20,000,000 that results from reduced Centaur upper stage procurement costs, a reduction of $15,000,000 in advanced research programs associated with the New Launch System, a reduction of $15,000,000 to delay work on Space Station support equipment, and a reduction of $10,000,000 to defer hardware replacement for Spacelab.

The reported bill also provides $10,000,000 in new funds for the initiation of a component technology development program to ensure continued competitiveness of the U.S. commercial launch industry.

Space Science—For space science and applications, including Physics and Astronomy, Life Sciences, Planetary Exploration, Earth Sciences, Materials Processing in Space, Communications, and Information Systems, the reported bill authorizes a total $2,574,600,000 in FY 1992.

The $1,128,600,000 provided for Physics and Astronomy will support ongoing activities related to the development of the Advanced X-ray Astrophysics Facility and the Global Geospace Science spacecraft, as well as a number of less complex Explorer spacecraft,

Shuttle/Spacelab flights, and suborbital missions. The bill is $12,000,000 below the President's request, reflecting reduced funding for phase B mission design studies for the Orbital Solar Laboratory and the Space Infrared Telescope Facility.

The $144,400,000 provided for Life Sciences in FY 1992 is a reduction of $39,400,000 from the President's budget, reflecting the deferral of the proposed Lifesat, the termination of funds for the SETI, and a reduction of funds requested to conduct life sciences research in support of future human exploration missions to the Moon and Mars. Remaining funds will enable NASA to understand better the effects of long-term human habitation in space, essential to the successful utilization of the Space Station and the Extended Duration Orbiter, as well as any future human space exploration missions.

The $299,300,000 authorized in FY 1992 by the reported bill for Planetary Exploration provides funding for continued development of the Mars Observer, as well as for continued research and analysis. The CRAF and Cassini missions were authorized last year in the FY 1991 NASA Authorization Act (P.L. 101-611). The reported bill amends that earlier authorization, decreasing the CRAF mission authorization for FY 1992 by $65,000,000.

The bill includes $780,600,000 for earth sciences programs, including full funding for the Earth Observing System (EOS), the Earth Observing System Data Information System (EOSDIS), and the Earth Probes Program, which comprise NASA's Mission to Planet Earth. The reported bill also provides $5,000,000 to NASA for the purchase of Landsat data, at cost of reproduction, for use in global change research.

The reported bill authorizes $125,800,000 for Materials Processing and $42,000,000 for Information Systems. It also provides $39,400,000 for Communications programs in FY 1992.

Commercial Programs—The bill authorizes the entire request from the President of $150,000,000 for Technology Utilization and the Commercial Use of Space Programs. NASA's Technology Utilization program is designed to enhance opportunities for the transfer of space-based technologies to other sectors of the economy, while the Commercial Use of Space programs are NASA's attempt to develop opportunities for private-sector investment and involvement in civil space activities through NASA's 16 Centers for the Commercial Development of Space (CCDS) and the Commercial Experimenter Transporter (COMET) Program.

Aeronautics and Space Technology—The reported bill provides the President's request of $591,200,000 in FY 1992 for NASA's Aeronautical Research and Technology Programs, as well as the $72,000,000 requested to support continued work on the Transatmospheric Research and Technology Program, a joint NASA/DOD effort to develop technologies that will enable future development of the National Aerospace Plane (NASP).

The bill, as reported, makes significant reductions to the President's request for Space Research and Technology Programs by deferring $52,000,000 requested for Exploration Technology Programs, as well as $15,000,000 for Exploration Mission Studies. All other space research and technology development programs are authorized at the levels requested by the President.

Safety, Reliability, and Quality Assurance—The reported bill provides the full $33,600,000 requested in the President's budget for Safety, Reliability, and Quality Assurance Programs, which are designed to reduce program risk throughout NASA.

Tracking and Data Advanced Systems—The reported bill provides full funding in FY 1992 for Tracking and Data Advanced Systems at $22,000,000. Under this program, NASA is working to develop higher performance tracking and data handling capabilities in support of future missions.

Academic Programs—The reported bill provides the amount requested by the President of $64,600,000 in FY 1992 for NASA's Academic programs, including the Space Grant College and Fellowship Program and a series of minority university research programs.

Space Flight, Control, and Data Acquisitions—The reported bill authorizes a total of $5,535,300,000 in FY 1992 for Space Flight, Control, and Data Acquisition, including Space Shuttle Production and Operational Capability, Space Transportation Operations, ELVs, and Space Tracking and Data Acquisition Programs.

The bill specifies that not less than $375,000,000 shall be made available for continued development of the Advanced Solid Rocket Motor (ASRM) Program. This amount, which is $125,000,000 above the President's request for this program, is needed to keep the ASRM development schedule on track for the planned first launch in late 1996. Of this additional amount, $50,000,000 is transferred from the Construction of Facilities account, with NASA directed to absorb remaining ASRM development costs from within the Space. Flight, Control, and Data Acquisition account.

The bill also assumes a $39,000,000 reduction to the President's FY 1992 budget request for the Space Transportation Operations account which is the result of increased efficiencies that NASA is expected to achieve in the Space Shuttle Program. The bill also assumes a reduction in the ELV account to reflect $12,000,000 in savings resulting from reduced Titan IV procurement costs, and a $39,000,000 reduction associated with launching the TDRS–G tracking and data relay satellite from the space shuttle, rather than from an ELV.

Construction of Facilities—The reported bill authorizes $430,300,000 for the Construction of Facilities account, a reduction of $50,000,000 from the President's request, reflecting the transfer of funds to the Space Shuttle Production and Operational Capability account to support continued development of the ASRM.

Research and Program Management—The reported bill authorizes $2,432,300,000 for Research and Program Management, which assumes a general reduction from the President's request of $20,000,000 in FY 1992. This amount will fund all civil service staff, maintenance of facilities, support of research and development programs and contract activities, and technical and administrative support of research and development programs.

Inspector General—The reported bill provides the level requested by the President of $14,600,000 for activities of the Office of Inspector General.

Other provisions—The bill, as reported, expresses the sense of Congress that the United States should maintain the current poli-

cies which prohibit the use of foreign launch capabilities for U.S. Government satellites. The bill also directs NASA to transmit annually to the Congress a 5-year budget detailing project development costs, as well as associated life-cycle costs.

As has been the case with prior NASA authorization bills, the reported bill instructs NASA to distribute research funds on a geographical basis where possible. It also directs that the Space Station may be used only for peaceful purposes. The bill also includes several provisions requested by the administration establishing parameters for the use of funds provided under the Construction of Facilities Program, the transfer of funds from one account to another, and the use of funds for activities approved by the Committee.

TITLE II—DOT AUTHORIZATION

The reported bill includes the FY 1992 authorization for the OCST within DOT in title II. The bill authorizes the President's request of $5,104,000 for FY 1992.

TITLE III—NATIONAL SPACE COUNCIL AUTHORIZATION

The reported bill includes the FY 1992 authorization for the activities of the National Space Council. For FY 1992, $1,491,000 is provided, the amount requested by the President.

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, May 31, 1991.

Hon. ERNEST F. HOLLINGS,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the attached cost estimate for H.R. 1988, the National Aeronautics and Space Administration Act, Fiscal Year 1992. The enactment of H.R. 1988 would not affect direct spending or receipts. Therefore, pay-as-you-go procedures would not apply to this bill.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

ROBERT D. REISCHAUER.

CONGRESSIONAL BUDGET OFFICE—COST ESTIMATE

1. Bill number: H.R. 1988.

2. Bill title: National Aeronautics and Space Administration Act, Fiscal Year 1992.

3. Bill status: As ordered reported by the Senate Committee on Commerce, Science, and Transportation on May 14, 1991.

4. Bill purpose: H.R. 1988 would authorize appropriations for 1992 to the National Aeronautics and Space Administration (NASA), the Office of Commercial Space Transportation (OCST) in the Department of Transportation, and the National Space Council in the Executive Office of the President

5. Estimated cost to the Federal Government:

[By fiscal year, in millions of dollars]

	1992	1993	1994	1995	1996
Authorization of Appropriations:					
NASA	14,995				
OCST	5				
National Space Council	1				
Total Authorization	15,001				
Estimated Outlays	9,426	4,438	1,072	43	22

The costs of this bill would be in budget functions 250, 400, and 800.

The above table does not include funding for the Comet Rendezvous Asteroid Flyby (CRAF)/Cassini Mission, for which $1.6 billion was authorized in Public Law 101-611, the 1991 NASA authorization. Because $174.5 million has been appropriated in 1990 and 1991, the remaining authorization for these programs is $1,425.5 million.

Including an estimated authorization for CRAF/Cassini in 1992 (based on spending plans obtained from NASA), aggregate authorizations for NASA in 1992 would be $15.3 billion.

The fiscal year 1991 appropriation for NASA is $14.0 billion, and the President has requested $15.7 billion for fiscal year 1992. Including outlays from prior year appropriations, and the existing CRAF/Cassini authorization, total outlays for NASA would be $14.6 billion in 1992 if the full amount authorized were appropriated.

Basis of Estimate: For this estimate we have assumed that the full amounts authorized would be appropriated for fiscal year 1992. the estimated outlays are based on historical spending patterns. Detailed estimates for NASA programs are shown in the table below.

The bill would provide authorizations for 1992 for research and development programs, space flight, control, and data communications programs, the Office of the Inspector General, construction of facilities, and research and program management.

AUTHORIZATIONS FOR NASA PROGRAMS PROVIDED BY H.R. 1988

[By fiscal year, in millions of dollars]

	1992	1993	1994	1995	1996
Research and Development:					
Authorization Level	6,582				
Estimated Outlays	3,469	2,514	599		
Space Flight, Control and Data Communications:					
Authorization Level	5,535				
Estimated Outlays	3,830	1,340	365		

AUTHORIZATIONS FOR NASA PROGRAMS PROVIDED BY H.R. 1988—Continued

[By fiscal year, in millions of dollars]

	1992	1993	1994	1995	1996
Construction of Facilities:					
Authorization Level	430	.....	.....	.....	.....
Estimated Outlays	43	215	108	43	22
Research and Program Management:					
Authorization Level	2,432	.....	.....	.....	.....
Estimated Outlays	2,067	365	.....	.....	.....
Office of the Inspector General:					
Authorization Level	15	.....	.....	.....	.....
Estimated Outlays	12	2	.....	.....	.....
Total, NASA Authorizations:					
Authorization Level	14,995	.....	.....	.....	.....
Estimated Outlays	9,422	4,436	1,072	43	22

6. Pay-as-you-go considerations: The Budget Enforcement Act of 1990 sets up pay-as-you-go procedures for legislation affecting direct spending or receipts through 1995. CBO estimates that enactment of H.R. 1988 would not affect direct spending or receipts. Therefore, pay-as-you-go procedures would not apply to this bill.

7. Estimated cost to State and local governments: None.

8. Estimate comparison: None.

9. Previous CBO estimate: On April 30, 1991, CBO prepared a cost estimate for H.R. 1988, the National Aeronautics and Space Administration Multiyear Authorization Act of 1991, as ordered reported by the House Committee on Science, Space, and Technology on April 25, 1991. The amount authorized in 1992 to NASA, the OCST, the National Space Council, and the Office of Space Commerce in the Department of Commerce by the House Science Committee version of H.R. 1988 would be $14.9 billion with resulting outlays of $9.4 billion. The House Committee's version also authorized $10.8 billion for 1993 and $11.0 billion for 1994.

10. Estimate prepared by: David Hull.

11. Estimate approved by: James L. Blum, Assistant Director for Budget Analysis.

Regulatory Impact Statement

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported.

Title I of this bill authorizes the appropriation of $14,994,500,000 in FY 1992 for the conduct of space and aeronautical research and development activities to carry out the policy and purpose of the National Aeronautics and Space Act of 1958. These activities are conducted in NASA laboratories, by NASA personnel and through contracts with industry, universities, and research institutions for research and development, and for supporting scientific and technical services. The Committee believes that title I, which extends funding authority for existing NASA programs, will not affect significantly the number of persons covered, will not increase the paperwork burden for any individual or business, will not have a sig-

nificant effect on individual privacy, and will not alter significantly the economic impact of the existing program.

Title II of the bill authorizes the appropriation of funds for the OCST at DOT. This office licenses and regulates the commercial ELV industry in order to protect the public health and safety, and ensure compliance with existing U.S. treaty and international obligations. This office was created to reduce the regulatory burden and paperwork requirements on the industry. The reported bill extends funding authority for existing programs.

Title III of the bill authorizes the appropriation of funds for the National Space Council. The Council was created to provide a high-level office dedicated to the formulation of space policy. A key role of the Council is to assist in reducing the regulatory burden of commercial space firms trying to market their services to the U.S. Government and to compete in foreign markets. The reported bill extends the authorization for the Council's ongoing activities.

In total, the Committee believes that the reported bill should not have an impact on the number of persons currently affected by the programs nor an adverse impact on individual privacy, or the paperwork requirements for any individual or business choosing to participate. While the bill authorizes an increase in funds for certain programs, it is not expected to have a significant additional impact on the national economy.

SECTION-BY-SECTION ANALYSIS

SECTION 1—SHORT TITLE

Section 1 states that the short title of this Act is the "National Aeronautics and Space Administration Authorization Act, Fiscal Year 1992."

TITLE I—FY 1992 NASA AUTHORIZATION

SECTION 101—AUTHORIZATION OF APPROPRIATIONS

Section 101 of the bill authorizes appropriations for NASA for FY 1992.

Research and development

Section 101(a) authorizes appropriations to NASA to become available October 1, 1991 for "Research and development." This subsection authorizes a total of $6,582,000,000 for Space Station; space transportation capability development; physics and astronomy; life sciences; planetary exploration; earth sciences; space applications; technology utilization; commercial use of space; aeronautic research and technology; transatmospheric research and technology; space research and technology; exploration mission studies; safety, reliability, and quality assurance; tracking and data advanced systems; and academic programs.

DISCUSSION OF SPECIFIC AUTHORIZATIONS

Space Station

The Committee authorizes $2,028,900,000 for the Space Station Freedom Program. This is the full amount requested by the Presi-

dent and reflects the Committee's continued strong support for this program.

Development of the permanently manned Space Station will add new momentum to the civil space program and is essential to preserving U.S. preeminence in space-based science, technology, and manned space flight. The Space Station Freedom Program will give the United States its first opportunity to gain direct experience in very long-term human operations in space and knowledge essential to future space exploration. It will enhance uniquely the U.S. space science programs, further the commercial utilization of space, and stimulate the development and application of advanced technologies of national importance. It is also the centerpiece of cooperation with our international partners, demonstrating the peaceful use of space for the benefit of all human beings

The Space Station Freedom will provide the United States with a permanently manned presence in space and is designed to accommodate diverse capabilities. This new national laboratory, a research center in space, will stimulate new technologies, enhance industrial competitiveness, further commercial space enterprises, and add greatly to our storehouse of scientific knowledge. The Space Station's microgravity environment and extended time in orbit will enable scientists to make new discoveries and materials research and life sciences.

The Space Station Freedom will be a multipurpose, international facility. In 1984, President Reagan invited the full participation of other nations. During the ensuing definition phase, Canada, member countries of the European Space Agency (ESA), and Japan worked closely with the United States to define their participation. These parallel definition and preliminary design studies have resulted in the identification of the Space Station elements to be developed by our partners. Negotiations with these international partners for the development phase of the program were completed in 1988. Agreements have been signed with Canadian Government for the development of a mobile servicing system and with the member countries of ESA for the inclusion of a pressurized attached module, a man-tended free flyer, and a polar platform. An agreement also has been signed with the Japanese Government for the development of an attached laboratory module. In accordance with the terms and agreements, the United States and the international partners will share the total available resources and the costs for its operations. With these developments in mind, the Committee believes that significant funding reductions or the termination of the Space Station Freedom Program would affect adversely U.S. foreign policy and hinder future international cooperative civil space activities.

Last year, in the conference report (House Report 101-900) accompanying the NASA appropriations bill (P.L. 101-507), Congress significantly reduced funding for the Space Station Program and directed NASA to develop a revised Space Station design and assembly launch sequence. In that conference agreement, Senate and House Appropriations Committees instructed NASA to develop an "incremental concept" which permits each phase of the Space Station assembly to be discrete and independent of the next phase. NASA was instructed that the first phase of Space Station develop-

ment should be devoted to microgravity materials science research, followed by life sciences research.

Several months later, in its December 1990 report, the Augustine Committee similarly recommended that NASA, in concert with the international partners, reconfigure and reschedule the Space Station. The Augustine Committee very clearly stated that the Space Station is an essential building block of the manned exploration program. However, it gave NASA guidance similar to that provided by the Appropriations Committees in rescoping the Space Station, as it recommended that steps be taken to reduce the Space Station's size and complexity, permit greater end-to-end testing prior to launch to reduce transportation requirements, reduce extravehicular activity (EVA) requirements, and reduce cost, where that reduction can be done without adversely affecting safety.

NASA's restructured Space Station plan, transmitted to the Congress in March 1991, calls for launch of the first Space Station element in the second quarter of FY 1996. Man-tended capability is expected in the third quarter of FY 1997, while permanently manned capability is to be achieved in FY 2000. The new plan specifies that the Space Station will reach permanently manned capability slightly more that 3 years later than had been planned in the earlier design. The length of the redesigned Space Station has been reduced from 493 feet to 353 feet, with a preintegrated truss, simplifying assembly and minimizing EVA. Similarly, the habitation and laboratory modules are reduced from 44 feet to 27 feet. The crew size is reduced from eight to four at permanently manned capability. Other changes have been made, with specific capabilities, such as the availability of 75-kilowatt power supply, deferred to a "follow-on phase," which is scheduled to begin after permanently manned capability is achieved. Other capabilities, such as the Flight Telerobotic Servicer, have been deleted entirely from the Space Station Program.

The Committee is pleased that NASA has complied with the direction provided last year by the Appropriations Committees for restructuring the Space Station design and assembly launch sequence. The new design is simplified and will be constructed on a more evolutionary, modular basis with reduced (EVA) flight requirements. The changes undertaken are positive for the future of the Space Station Program.

In authorizing the President's requested funding level for the Space Station, the Committee has expressed its strong support for continuation of this important program. However, there is concern that during hearings on the Space Station, testimony by NASA officials highlighted the fact that the agency has excluded certain items from cost estimates for the proposed Space Station redesign.

At the Science, Technology, and Space Subcommittee's April 16 1991, hearing, NASA admitted that funds needed for development of the Assured Crew Rescue Vehicle (ACRV), which NASA has said that it must have when the Space Station reaches permanently manned capability, have not been included in the $30 billion redesign. The ACRV is estimated to cost between $1.5 and $2.0 billion. NASA stated that it expects to submit to Congress a request for funds for the ACRV in FY 1993 or FY 1994. Yet, the redesigned Space Station plan, which NASA asserts includes all other develop-

ment, launch, and operations costs through FY 2000, does not include this amount. The Committee remains uncertain as to how NASA expects to fund and account for the additional costs needed for the ACRV—that is, whether it will be considered as an addition to the $30 billion Space Station total or taken from within that amount, drawing upon funding reserves.

Similarly, NASA testified that the $32,000,000 cost for the Space Station node, in which the life sciences centrifuge will be housed ultimately, has not been included in the new funding plan. NASA officials assert that this will be paid for out of Space Station reserves, which, as is discussed below, are already at low levels.

The costs of these future add-ons are troubling as the Committee evaluates not only the budget request for FY 1992, but also how legislative actions taken this year affect NASA's funding needs in future years. The Budget Enforcement Act of 1990 established very specific limitations on future-year funding increases for NASA and the entire Federal Government. Therefore, detailed figures on future Space Station program costs are critical. Historical program cost growth in this and other programs, along with planned reserves for the Space Station that NASA has said will average around 20 percent of the total program budget, raises concerns that a situation may develop where NASA has not adequately anticipated total program costs. This situation is exacerbated by expected add-on costs in the next several years that will be needed to enable NASA to fulfill its commitments to the international partners, such as the fourth solar array, estimated to cost $200,000,000 to develop, or the second habitat, which NASA stated would cost $50,000,000. These outyear program costs are important because congressional authorization of a program of this magnitude and duration will affect the availability of funds for all other NASA programs for many years to come, a conclusion affirmed by recent testimony by the Comptroller General of the United States on the Space Station Program. The Committee therefore urges NASA to revisit its funding needs through the remainder of the decade and more accurately define for the Committee the total Space Station Program costs. To address this situation, the Committee has included statutory language in section 108 requiring the submission of a detailed 5-year project development costs report to Congress.

There has been a great deal of attention by the scientific community to the research capabilities that will be provided in the restructured Space Station. As currently designed, the Space Station Freedom is envisioned to serve as a laboratory for the conduct of microgravity materials science as well as life science research. In the early stages of Space Station development, the focus would be on microgravity research, and life science research would begin in earnest after permanently manned capability is achieved in the next century.

The recent report by the National Research Council's Space Studies Board expresses very clear concerns that "the Space Station Freedom, at the present stage of redesign, does not meet the basic research requirements of the two principal scientific disciplines for which it was intended: (1) life sciences research necessary to support the national objective of long-term human exploration of space, and (2) microgravity research and applications." Witnesses

testifying before the Science, Technology, and Space Subcommittee agreed that, because of limitations in crew size and power, the Space Station Freedom could not be justified solely on its scientific capabilities. The Committee is pleased that some of these concerns have been addressed by NASA's commitments to provide critical scientific tools, such as the centrifuge, in the first Space Station assembly flight after permanently manned capability has been achieved. The Committee expects NASA to continue to make every effort to enhance the scientific capabilities of the Space Station and to honor commitments to the scientific community, made both in the redesign proposal and at congressional hearings, for enhancing this premier international research facility.

NASA officials are currently conducting a study to identify areas for management improvement in the Space Station Program. Among the factors being considered is the location of the level II function. NASA management should conduct such studies, and it should consider all relevant factors that are important to the success of the program. In addition to any cost savings and management benefits, for example, any relocation decision also should include a review of any added costs, schedule delays, and employee relocation problems which might result from relocating the level II program office.

The original rationale for an independent level II program office, following an investigation of the Challenger accident, was to provide the accountability and impartiality necessary to manage properly a multicenter, international program like the Space Station. Any change in this approach would require an adequate explanation and justification.

The Committee requests consultation with NASA officials before any decisions are made which would require additional expenditures from regular appropriations, Research and Program Management, or any other budget line, for the purpose of relocating the Level II program office from its current location.

The Committee maintains its belief that the Space Station should be used for peaceful purposes in accordance with international law. Accordingly, the Committee has incorporated language in section 106 of the reported bill which affirms this position.

Space transportation capability development

The Committee authorizes $704,800,000 for Space Transportation Capability Development in FY 1992. This is $175,000,000 below the President's budget request.

Summary of fiscal year 1992 funding levels

Spacelab	$140,200,000
Upper stages	88,500,000
Engineering and technical base	235,200,000
Payload operations and support equipment	129,500,000
Advanced programs	38,800,000
New Launch System	50,000,000
Tethered satellite system	12,600,000
Launch Technology Development	10,000,000
Total	704,800,000

The principal areas of activity in Space Transportation Capability Development include operation of the Spacelab systems with some continuing development activities; procurement of Upper Stages required to place satellites in high altitude orbits; the Engineering and Technical Base support at the manned space flight centers; Payload Operations and Support Equipment for accommodating NASA payloads; Advanced Programs study and evaluation efforts; Advanced Transportation Technology efforts, including the definition and preliminary development of improved propulsion and launch technologies; and the design and development of the U.S./Italian Tethered Satellite System.

The Committee has reduced the President's request by a total of $175,000,000, including a reduction of $125,000,000 from the proposed New Launch System. Of the remaining funds requested for this new program, the reported bill authorizes $40,000,000 for propulsion technology development and $10,000,000 for launch vehicle design studies.

The New Launch System, which is proposed as a new start in the FY 1992 budget request, is the administration's response to the recommendations of the Augustine Committee. In recognition of an array of problems in 1990 that temporarily grounded the fleet of space shuttles, the Augustine Committee recommended the development of an unmanned, but man-ratable, space transportation system capable of offloading certain payloads planned for launch on the Shuttle. Detailed proposals for the cost, schedule, and design configuration of this new launch vehicle have not yet been transmitted to Congress. However, in testimony before the Science, Technology, and Space Subcommittee, the Administrator stated that the earliest possible schedule for first flight of the New Launch System was the end of 1999 and that its cost range was between $10 and $12 billion, an amount that would be shared equally by NASA and DOD. The Administrator also stated that possible missions for the New Launch System of interest to NASA include logistics flights to service the Space Station after permanently manned capability has been achieved, as well as flights supporting continued development during the Space Station's follow-on phase in the next century. Further application of the New Launch System would be to future human exploration missions to the Moon and Mars.

The chairman of the Augustine Committee testified that, while it would be desirable to develop new technology for the type of launch vehicle the Augustine Committee had recommended, such an initiative takes significant amounts of time and money. Mr. Augustine testified that the Advisory Committee concluded that it would be better for the space program if NASA has an operational launch vehicle capable of offloading the space shuttle sooner rather than later. The Committee concurs with the view articulated by Mr. Augustine that NASA should proceed more expeditiously and cost effectively toward development of a launch vehicle than has been proposed by the administration with the New Launch System. Looking to the future, the Committee is concerned that any new launch vehicle development program that creates a funding "wedge" in the NASA budget as high as $1 billion a year, as the New Launch System would, will be difficult to sustain.

By providing funds in the reported bill for continued engine technology development, progress will continue to be made on development, progress will continue to be made on development of the Space Transportation Main Engine, which is a long-lead item critical to future launch systems. The bill also provides $10,000,000 for launch vehicle design studies, which are essential for the Committee to understand and consider the configuration of any proposed future launch system. In this regard, the Committee urges NASA to consider launch vehicle designs that can fulfill the recommendations of the Augustine Committee and still fit within the constrained funding profile NASA will likely find itself in over the next several years. The Committee continues to support the development of new launch technologies and designs, but is concerned that the current funding profile for the New Launch System may hinder funding needed to support those programs, such as space science and the Mission to Planet Earth, that the Augustine Committee concluded were of a higher priority.

The reported bill makes other changes to the Space Transportation Capability Development budget, including a reduction of $20,000,000 that results from reduced Centaur upper stage procurement costs, a reduction of $15,000,000 in advanced research programs associated with the New Launch System, a reduction of $15,000,000 to delay work on space station support equipment, and $10,000,000 to defer hardware replacement for Spacelab.

The bill also authorizes $10,000,000 to initiate a focused research and development program of component technology development, validation, and demonstration directed at commercial launch vehicle competitiveness. Although the commercial launch industry in this country is relatively small in size; the services it provides are clearly significant. Accordingly, the Committee believes that NASA, with its jurisdiction over research and development of technologies applicable to the civil space program, should undertake a program to ensure that the U.S. launch industry remains competitive in the world marketplace. Specifically, these funds should be used to establish a focused program of developing the propulsion, guidance and control, vehicle, ground support, and other technologies that would enhance the competitiveness of the U.S. commercial launch industry.

Physics and astronomy

The Committee authorizes $1,128,600,000 for Physics and Astronomy in FY 1992. This represents a reduction of $12,000,000 from the President's budget request.

Summary of fiscal year 1992 funding levels

Global geospace science	$65,300,000
Advanced x-ray astrophysics facility development (AXAF)	211,000,000
Payload and instrument development	115,900,000
Shuttle/Spacelab payload mission management and integration	88,000,000
Explorer development	107,900,000
Mission operation and data analysis	376,400,000
Research and analysis	103,100,000
Suborbital program	61,000,000
Total	1,128,600,000

The objectives of NASA's Physics and Astronomy Program are to increase our understanding of the origin and evolution of the universe, the fundamental laws of physics, and the formation of stars and planets. Objects studied by the astrophysics program include distant galaxies and galactic clusters, as well as stars and other structures in nearby galaxies and the interstellar medium in our galaxy. Unusual and exotic phenomena—such as quasars, neutron stars, pulsars, and black holes—are of particular interest to the Astrophysics program, and are the target of many ground-based and space-based research programs.

In the Space Physics Program, intensive study of our own sun, with its multitude of time-varying phenomena, provides key answers to a vast range of questions requiring comprehensive research into polar-terrestrial processes and the physics and coupling between the solar wind, magnetosphere, ionosphere, and atmosphere.

The objectives of the Physics and Astronomy Program are accomplished with a mixture of large, complex, free-flying space missions, less complex Explorer spacecraft, Shuttle/Spacelab flights, and suborbital missions. Space-based research allows observations in the infrared or the ultraviolet wavelengths that cannot be conducted on the ground due to the obscuring effects of the atmosphere. Also, observations in the visible light region are vastly improved when conducted above the atmosphere. The entire program rests on a solid basis of supporting research and technology, data analysis, and theory.

Research terms involved in this program are located at universities, industrial laboratories, NASA field centers, and other Government laboratories. The scientific information obtained and the technology developed in this program are made available to the scientific communities and the general public for application to the advancement of scientific knowledge, education, and technology.

The authorization for these programs in the reported bill represents a reduction from the President's request of $12,000,000 to reflect the deferral of the phase B mission design studies for the Space infrared Telescope Facility and the Orbital Solar Laboratory. Slowing development on these two missions will help ensure that adequate resources will be available within NASA's space science budget for their successful development.

Life Sciences

The Committee bill authorizes $144,400,000 for Life Sciences in FY 1992, which is a reduction of $39,500,000 from the budget request.

Summary of fiscal year 1992 funding levels

Human space flight and systems engineering	$58,600,000
Space biological sciences	31,100,000
Research and analysis	54,700,000
Total	144,400,000

The two major goals of the Life Sciences Program are to develop medical and biological systems which enable human habitation in space and to advance the knowledge about the life processes of the

universe. Results from the research program are applied to: (1) the immediate needs of maintaining astronaut health and productivity; (2) understanding the response of biological mechanisms to weightlessness; (3) the development of environmental health requirements for space flight and design of controlled and bioregenerative life support systems; (4) understanding the origin, evolution, and distribution of life in the universe; and (5) understanding the biosphere of the planet Earth.

Continuing support of the Life Sciences Program is needed to: (1) understand the basic biological mechanisms of responses to gravitational forces; (2) evolve the critical technologies necessary to enable long-term, piloted space flight; and (3) develop the capability to sustain a permanent manned presence in space. The research program studies fundamental biological processes through both ground-based and space research efforts which are mutually supportive and integrated.

The reported bill makes several changes to the President's request for funds for NASA's Life Sciences Programs in FY 1992. Specifically, the bill does not provide for (1) the $15,000,000 requested for the proposed Lifesat, a series of recoverable biosatellites proposed to define the effects of space radiation and microgravity on humans in long-term habitation of space; (2) the $14,500,000 requested for continued support of the SETI; and (3) the $10,000,000 requested to support Life Sciences research related to future human exploration missions to the Moon and Mars.

During hearings before the Science, Technology, and Space Subcommittee on NASA's space science budget request, testimony by NASA officials indicated that the cost of developing, launching, and operating Lifesat was expected to total $870,000,000. In looking at the NASA budget, not only for FY 1992, but projected throughout the remainder of the decade, the Committee determined that this represented an excessive amount, particularly given other higher priorities in the space science and applications budget and strategic plan. The decision to not include these funds in the bill as reported also is consistent with the Committee's previous actions to defer funding for programs dedicated to human exploration of the Moon and Mars.

The Committee's action to delete funds for continuation of the SETI Program is consistent with the Augustine Committee's view that NASA is "currently overcommitted in terms of program obligations relative to resources available." The Federal Government, including NASA, must begin to prioritize more effectively programs to reflect realistic funding levels. In light of the many competing demands for Federal financial resources, there is no sufficient justification to authorize continued funding for SETI, a program of uncertain, and perhaps questionable, benefits.

Planetary exploration

The reported bill authorizes $299,300,000 for Planetary Exploration in FY 1992. This amount is authorized in addition to the existing authorization for CRAF/Cassini, which is amended by the reported bill to reflect a $65,000,000 reduction to the CRAF mission.

Summary of fiscal year 1992 funding levels

Mars Observer	$54,400,000
Mars balloon relay	1,200,000
Mission operations and data analysis	150,500,000
Research and analysis	93,200,000
Total	299,300,000
CRAF/Cassini (amended authorization)	263,000,000

NASA's Planetary Exploration Program encompasses the scientific exploration of the solar system including the planets and their satellites, comets and asteroids, and the interplanetary medium. The program objectives are: (1) to determine the nature of planets, comets, and asteroids as a means for understanding the origin and evolution of the solar system; (2) to understand better the Earth through comparative studies with the other planets; (3) to understand how the appearance of life in the solar system is related to the chemical history of the solar system; and (4) to provide a scientific basis for the future use of resources available in near-Earth space. Projects undertaken in the past have been highly successful based on a strategy that places a balanced emphasis on the Earth-like inner planets, the giant gaseous outer planets, and the smaller bodies (comets and asteroids). Missions to these bodies start at the level of reconnaissance to achieve a fundamental characterization of the bodies, and then proceed to levels of more detailed study.

With the Magellan mapping of the Venusian terrain, the reconnaissance phase of innerplanetary exploration which began in the 1960s will be virtually complete. In addition to Magellan, the Pioneer Venus mission continues to carry the study of the Earth's nearest neighbor and closest planetary analog beyond the reconnaissance stage to the point where we now have obtained a basic characterization of Venus' thick, massive atmosphere, as well as fundamental data about the formation of the planet. Mars has provided program focus because of its potential as a site of biological activity. The Viking landings in 1976 carried the exploration of Mars forward to a high level of scientific and technological achievement, thereby setting the stage for the next step of detailed study. Analyses of meteorites and the lunar rock samples returned by Apollo continue to be highly productive, producing new insights into the early history of the inner solar system and thus leading to a revision of our previous theoretical concepts.

The exploration of the giant outer planets began more recently. The Pioneer-10 and -11 missions to Jupiter in 1973 and 1974 were followed by the Voyager-1 and -2 spacecraft encounters with Jupiter in 1979. Voyager-1 then encountered Saturn in November 1980, and Voyager-2 encountered Saturn in August 1981. The Voyager data on these planets, their satellites, and their rings have revolutionized our concepts about the formation and evolution of the solar system. Voyager-2 encountered Uranus in January 1986 and has provided our first look at this giant outer planet. Its trajectory carried it to an encounter with the planet Neptune in August 1989 and provided spectacular images of this mysterious planet and its satellites. In February 1990, Voyager-1 took the first snapshot ever of our solar system. As the Pioneer-10 and -11 and Voyager-1 and

-2 spacecraft trajectories take them outside the solar system, they continue to return scientific data about the system's outer regions.

Last year, Congress agreed to authorize full funding for the CRAF and Cassini missions, capping development costs for both at $1.6 billion. Since that time, the CRAF mission has incurred considerable cost growth and inadequate international funding, causing NASA to conduct an independent review of this program. This cost review board identified cost and technical risks associated with one of the mission's key instruments, the Penetrator/Lander, originally proposed for probing the comet's surface. In an effort to remain within total development costs, NASA responded last November by descoping the CRAF mission, eliminating both the Penetrator and the Scanning Electron Microscope and Particle Analyzer. The deletion of these important scientific instruments, along with the fact that there no longer will be any university involvement beyond data analysis on the CRAF mission, led the Committee to conclude that the CRAF mission should be terminated. Accordingly, the reported bill amends the previous CRAF/Cassini authorization by reducing the total by $65,000,000 in FY 1992. This will allow greater attention to be focused on the Cassini mission to Saturn, which the Committee continues to support.

Earth sciences and applications

The Committee authorizes $780,600,000 for Earth Sciences in FY 1992. This is $5,000,000 more than the President's budget request, which is to be used for the purchase of Landsat data at the cost of reproduction for use in global change research.

Summary of fiscal year 1992 funding levels

Earth Observing System (EOS)	$253,400,000
EOS Data Information System	82,600,000
Earth Probes (inc. Scatterometer)	68,200,000
Remotely piloted aircraft	5,000,000
Upper Atmos. Research. Satellite (UARS)	18,200,000
Ocean Topography Experiment (TOPEX)	51,900,000
Payload and instrument development	48,600,000
Mission operations & data analysis	56,300,000
Interdisciplinary research	2,500,000
Modelling and data analysis	45,000,000
Process studies	114,300,000
Research facilities	29,600,000
Landsat data acquisition	5,000,000
Total	780,600,000

The specific objectives of NASA's Earth Science Program are to improve our understanding of the processes in the atmosphere, oceans, land surface, and interior of the Earth and advance our knowledge of the interactions among these environments. The program provides space observations of parameters involved in these processes and extends the national capabilities to predict environmental phenomena, both short and long term, and their interaction with human activities. Because many of these phenomena are global or regional, they can be most effectively, and sometimes only, observed from space. NASA's programs include scientific research efforts, as well as the development of new technology for global and synoptic measurements. NASA's research satellites,

Shuttle/Spacelab payload program, and Airborne Science and Applications Program provide a unique view of the planet Earth, its physical dynamics, and radiative and chemical processes which affect habitability and the solar-terrestrial environment.

Several significant objectives have been established during the next decade for this program. These include advancing our understanding of the upper atmosphere through the determination of the spatial and temporal distribution of ozone and select nitrogen, hydrogen, and chlorine species in the upper atmosphere and their sources in the lower atmosphere; characterizing the current state of the terrestrial landscape, including the biosphere and the hydrosphere; optimizing the use of space-derived measurements in understanding large-scale weather patterns; advancing our knowledge of severe storms and forecasting capabilities, ocean productivity, circulation, and air-sea interactions; and improving the knowledge of seasonal climate variability leading to a long-term strategy for climate observation and prediction. Studies of the cycling of key biogeochemical elements, interactions between the biosphere and the climate system, the composition and evolution of the Earth's crust, and the processes that shape the Earth's crust are essential to our understanding of the global environment.

The ongoing NASA program is making critical near-term contributions to understanding the Earth as an integrated system as well as to environmental issues including global warming and ozone depletion. NASA's base program combines ground-based measurements, laboratory studies, data analysis, and model development with a progressive series of satellite missions, contributing to the scientific research base in ozone monitoring, ocean circulation, and atmospheric chemistry. All of these programs are precursors to "Mission to Planet Earth."

In its findings and conclusions, the Augustine Committee recognized that the Mission to Planet Earth, which is an attempt to bring space to people on Earth, was an essential component of the future U.S. civil space program. In fact, the Augustine Committee concluded that the Mission to Planet Earth "connotes some degree of urgency." The Committee strongly agrees with this conclusion and supports full funding for the programs that comprise NASA's Mission to Planet Earth.

The first major element of NASA's Mission to Planet Earth is EOS. The primary objective of EOS is to documentt global change and observe regional-to-global scale processes. Utilizing a series of satellites, the EOS will document global change over a 15-year period to provide long-term, consistent data sets for use in modelling and understand global processes. As currently conceived, this will be accomplished by flying a series of EOS–A and EOS–B spacecraft, each will a suite of instruments.

The process and modeling research effort will provide the basis for establishing predictive global change models which may be used by policymakers and scientists in formulating strategies to manage human impacts on global processes such as the greenhouse effect, ozone depletion, and deforestation.

Last year, the Congress approved EOS as a new program start for NASA. However, in spite of the fact that NASA testified that $340,000,000 has been spent thus far on the EOS program, debate

continues in the scientific community as to whether the large EOS platforms are the best means of gathering needed data for scientific research on the Earth's environmental processes. Testimony before the Science, Technology, and Space Subcommittee indicated that other potential options exist which could provide the data needed by earth science researchers more quickly and inexpensively than the current plan of waiting until 1999 for the launch of the first EOS-A platform. To further address this matter, NASA has established an EOS Engineering Review Advisory Committee to assess alternatives for the implementation of this program. In examining the structure and content of this important program, the Committee urges the Engineering Review panel to consider many alternatives to the EOS platforms that could provide the data to researchers more quickly and inexpensively than currently planned.

Less than 1 year after requesting initial funding for the EOS program, the FY 1992 funding level for this program has been trimmed substantially by the Office of Management and Budget (OMB). Testimony by NASA officials indicated that the OMB-mandated reduction to planned FY 1992 expenditures for the EOS program totalled $124 million. The effect of this substantial reduction will be to stretch out this critical program. NASA testified that, after the OMB-mandated reductions, further cuts would cripple the EOS program. Believing strongly that there are compelling needs to collect and analyze long-term data on the Earth's environmental systems, the Committee opposes further reductions to EOS and urges that this program move forward as expeditiously as possible.

A key element enabling the EOS program to meet the long-term science goals of the Mission to Planet Earth is the EOSDIS. The EOSDIS is intended to provide the processing, storage, and distribution of all the science data collected by the EOS spacecraft, as well as preceding and succeeding missions and the resulting scientific products. EOSDIS will be implemented as a distributed system, with a network of Distributed Active Archive Centers (DAAC's) supporting experts developing science tools in designated disciplines. The DAACs will perform continuous processing of instrument data to derive the underlying scientific parameters of interest to individual researchers. The network will link the archived data and resulting products so that investigators may access the entire set of holdings from any entry point. An information management service will help users locate data within the total archive system.

The Committee is troubled by continuing reports by the General Accounting Office (GAO) that highlight NASA's shortcomings in archiving existing space science data, particularly given the enormous amounts of new data that is expected to be generated by EOS and the other components of the Mission to Planet Earth. Too often in the past data management has been a very low priority at NASA. The Committee supports NASA's efforts to make the EOSDIS a priority, but intends to carefully monitor the agency's progress in overcoming its past data management deficiencies.

Release of the request for proposals for the EOSDIS "Version 0" has been delayed several times by NASA, with current plans for its release this summer. Consistent with comments urging continued

progress on the EOS program, the Committee urges NASA to maintain its schedule for selecting an EOSDIS contractor.

In addition to the large EOS platforms, NASA's Mission to Planet Earth includes the series of spacecraft known as the Earth Probes, which is an explorer class program designed to address specific, highly focused problems in Earth science. Planned Earth Probes include the Total Ozone Mapping Spectrometer (TOMS), the Scatterometer, and the Tropical Rainfall Measurement Mission (TRMM). The TOMS instrument will provide data on total atmospheric ozone concentrations. Collection of this data was begun in 1978 with the launch of the Nimbus-7. The first TOMS Earth Probe will be launched on a small-class vehicle in 1993 and on the Japanese ADEOS satellite in 1995. The Scatterometer will provide global measurements of ocean surface winds which will aid both oceanography and meteorology, while the TRMM will measure precipitation in the tropical latitudes.

The Committee has authorized NASA's request for $5,000,000 for initial evaluation and planning of the application of remotely piloted aircraft for earth sciences research. While supportive of the concept of using remotely piloted flight vehicles for environmental monitoring, however, the Committee is wary of any new long-term, costly program within NASA to develop such aircraft. This is particularly important given the fact that other Federal agencies, most notably DOD through the Condor Program, already have made significant investments in developing remotely piloted aircraft. The Committee believes that NASA, rather than developing a new remotely piloted flight vehicle solely for environmental monitoring, must make every effort to utilize existing flight vehicles, designed originally for other purposes, but which could be outfitted with appropriate environmental sensors. Therefore, the Committee directs NASA to conduct a comprehensive review and report to Congress on multiple agency requirements for high altitude, long-duration flights by remotely piloted aircraft that could be used for earth science sampling and measurement.

There is a substantial wealth of existing date of potential use in global change research that has been collected by classified remote sensing systems. In the FY 1991 NASA authorization bill (P.L. 101-611), $1,000,000 was authorized to begin the process of converting certain data collected by DOD and the intelligence communities to civilian use for global change research. NASA needs to devote more attention to making this data accessible to civilian researchers and to utilizing better all types of earth science data already collected and archived for critical global change research.

One existing data set that the Committee believes has been severely underutilized in the conduct of global change research is Landsat data. The Landsat data set is a two-decade record of environmental change and represents a valuable resource to scientists involved in global change research. Unfortunately, the cost of Landsat data is a major impediment for scientists conducting noncommercial research. Accordingly, the reported bill authorizes $5,000,000 for NASA to use in purchasing Landsat data, at the cost of reproduction, for use in global change research.

Materials processing in space

The Committee authorizes $125,800,000 for Materials Processing in FY 1992. This is same as the President's budget request.

Summary of fiscal year 1992 funding levels

Research and analysis	$16,600,000
Materials experiment operations	85,500,000
Space Station utilization	21,300,000
Commercial microgravity R&D enhancements	2,400,000
Total	125,800,000

The Microgravity Science and Applications Program uses the unique attributes of the space environment to conduct research in three primary areas: (1) Fundamental Science, which includes the study of the behavior of fluids, transport phenomena, condensed matter physics, and combustion science; (2) Materials Science, which includes electronic and photonic material, metals, alloys, glasses, and ceramics; and (3) Biotechnology, which focuses on micromolecular crystal growth and cell science. A goal of the program is to develop a comprehensive research program in these areas, to attain a more structured understanding of those physical phenomena made obscure by the effects of gravity. This understanding will provide the basis of a reliable predictive capability for processing operations and technology issues in both Earth and non-Earth environments. In FY 1992, ground-based research and payload development will support this program goal.

The Materials Processing Program provides a range of experimental capabilities. The program currently supports a wide variety of hardware development, from unique flight experiments necessary to conduct fundamental research to modular, multiuser research facilities that will be the cornerstone of microgravity science and applications research on the Space Station Freedom. Experiments will be flown principally on the Space Shuttle and Spacelab.

The Committee continues to be supportive of the Materials Processing Program and believes that the long-term return from this program will be substantial. This program is a necessary precursor to the technological and commercial exploitation of the microgravity environment. For this reason, the Committee has authorized the full budget request of $125,800,000 for materials processing in space for FY 1992.

Communications

The Committee authorizes $39,400,000 for Communications in FY 1992. This is the same as the President's budget request.

Summary of fiscal year 1992 funding levels

Advanced communications technology satellite (ACTS)	$11,200,000
Advanced communications research	15,300,000
Search and rescue	1,300,000
Radio science and support studies	3,300,000
Communications data analysis	8,300,000
Total	39,400,000

Advanced communications research continues to provide the development of subsystem component technology required by NASA,

other government agencies, and U.S. industry for advanced communications satellite systems. Special emphasis is being given to technologies with high potential for improving spectrum utilization, satellite switching, and intersatellite link technologies, since these technologies are the key to future growth of the communications satellite and terminal workers. An example of the technologies under study is optical space communications, which will improve greatly space communications capabilities. The mobile communications technology program has completed development of enabling technologies and is now ensuring the use of the technology by the private sector.

The Advanced Communications Technology Satellite (ACTS) Program will develop advanced technologies and use these technologies in a joint experiments program with U.S. industry to prove the utility of on-board switching, using the ACTS baseband processor, and simultaneous communications transmissions to different terrestrial locations through an intricate, multibeam antenna.

Information systems

The Committee authorizes $42,000,000 for Information Systems in FY 1992. This is the same as the President's budget request.

The Information Systems Program is divided into four major discipline areas: scientific computing; science data management and archiving; science networking; and information systems research and analysis. The Information Systems Program provides the advanced data systems to support the Nation's space sciences and applications flight and research projects.

Scientific computing provides for the operation of supercomputing resources of the NASA Space and Earth Sciences Computing Center (NSESCC) in support of modeling and simulation efforts. The program also provides a supercomputing capability at the Jet Propulsion Laboratory to support the research community. Also included are the definition and development of capabilities necessary for efficient use of space science and applications research and computing assets.

Science data management and archiving provides NASA's Office of Space Science and Applications (OSSA) research community with reliable systems to archive and distribute data. The National Space Science Data Center (NSSDC) archives and distributes data acquired from spaceflight investigations. The OSSA researchers benefit from automated retrieval of archived data, a master directory for the location of distributed data sets by researchers, and delivery of data on advanced media as requested by users. Services now under development include catalog interoperability for common searches across distributed databases and utilization of data exchange standards to facilitate automated assimilation of data by user applications.

The main area of science networking is the NASA Science Internet, a computer networking services developed for NASA's space science and applications community to enable NASA researchers worldwide to connect to databases, to computational resources, and also to other scientists for interactive collaboration. A main objective is to provide transparent and reliable networking connectivity to support OSSA's flight missions and discipline programs, includ-

ing joint projects with other agencies and international organizations.

Information systems research and analysis emphasizes the application of advanced computer information systems technology to improve the effectiveness and efficiency of science data management, analysis, and visualization.

The GAO recently reported to the Committee that the volume of data estimated to be gathered from future space science missions will rise over 5,600 percent from 1990 to 2000. Such a massive increase will require an extraordinary effort to ensure that all the valuable data is archived in a manner accessible to scientific researchers. The Committee is concerned that NASA has not archived successfully much of the space science data already on hand. Again, the GAO reported to Congress in November 1990 that, with respect to 23 of 37 important scientific missions, NASA had archived less than 60 percent of the required data. Accordingly, the Committee expects NASA to move expeditiously to comply with the GAO recommendations in order to enhance its data management and archiving activities.

Commercial programs

The Committee authorizes $150,000,000 for Commercial Programs in FY 1992. This is the same as the President's budget request and reflects the Committee's strong support for NASA's Commercial Use of Space and Technology Utilization Programs.

Summary of fiscal year 1992 funding levels

Technology utilization	$32,000,000
Commercial use of space	118,000,000
Total	150,000,000

The Technology Utilization Program promotes the transfer of technology developed in NASA's research and development programs to the public and private sectors of the U.S. economy. A network of Industrial Applications Centers (IACs), Technology Counselors, and NASA Installation Technology Utilization Officers forms the core of the agency's technology transfer efforts.

Technologies developed for the Nation's aerospace program are reused or reengineered to provide new products and processes in the areas of transportation, energy, medicine, public safety, and consumer goods. The goals of the program are to broaden and accelerate the technology transfer process, to realize additional dividends on the national investment in aerospace research, and to ensure that the United States maintains its competitive position in the international marketplace.

In December 1990, NASA announced a proposal to reorganize, effective January 1, 1992, its present nationwide network of IACs. This reorganization will result in a NASA system composed of 6 Regional Technology Transfer Centers (RTTC) in place of the current 11 IACs. All present IACs are scheduled to be closed as the new RTTCs are opened. However, certain States have an interest in preserving the activities performed by NASA IACs located in their jurisdictional boundaries. In one such instance, the Commonwealth of Kentucky is seeking to restructure the University of

Kentucky's Technology Applications Center (UK/TAC) into a State-level technology transfer organization. Under current plans, however, NASA intends to terminate its present contract with the UK/TAC on June 30, 1991, before the Kentucky General Assembly can meet to provide the necessary funding to effectuate the desired transfer. The UK/TAC presently contains the capability to act as a hub to assist other State and local government agencies in the conduct of their technology-related missions, and the cost to recreate this capability would be too great. As such, the Committee directs NASA, as a part of its reorganization, to work with the existing IACs, including the UK/TAC, to ensure that these technology transfer efforts can be transferred successfully and continued at other levels of government

The goal of the Commercial Use of Space Program is to support a national focus which develops opportunities for the expansion of U.S. private-sector investment and involvement in civil space activities. The specific objectives of the program are to: (1) foster close working relations with the private sector and academia to encourage investment in space technology and the use of the in situ attributes of space—vacuum, microgravity, temperature, and radiation for commercial purposes; (2) facilitate private sector space activities through improved access to available NASA resources and the development of new high-technology space ventures and markets; (3) encourage increased private-sector investment in the commercial use of space independent of NASA funding; and (4) implement and support commercial space policy throughout NASA.

NASA's goal of expanding opportunities for U.S. private-sector investment and involvement in civil space and space-related activities is pursued through a variety of interrelated programs. Through cooperative agreements such as joint endeavor agreements and through support to the CCDS (Centers for the Commercial Development of Space), the amount of space-related research conducted by the private sector, the number and type of NASA and private-sector facilities available for space use, and the private-sector awareness of the opportunity to use NASA's terrestrial and space-based facilities for commercial research will be increased.

The CCDS consortia of universities and private sector commercial enterprises are the primary focus of research activities intended to result in the commercial development of space. To date, 16 centers have been established and currently conduct research in such diverse areas as space propulsion, biotechnology, materials processing, and space remote sensing.

NASA's commercial programs have suffered traditionally from a lack of firm flight opportunities. However, in an effort to provide CCDS payloads with timely and varied access to space, and further to support commercial space transportation capability development, several new initiatives were begun in FY 1991. These included augmentations to the existing sounding rocket program to lengthen payload exposure to the microgravity environment; development of the (COMET) ELV program which will provide the long duration microgravity exposure required for some commercial payloads; and the lease of commercially provided payload module which will provide pressurized man-tended payload capability in the space shuttle cargo bay. This lease agreement with Spacehab

was concluded in late 1990 and represents NASA's first "anchor tenant" arrangement with a commercial entity.

Aeronautical research and technology

The Committee authorizes $591,200,000 for Aeronautical Research and Technology in FY 1992. This is the same as the President's budget request.

Summary of fiscal year 1992 funding levels

Research and technology base	$375,600,000
Systems technology programs	215,600,000
Total	591,200,000

The goal of the NASA aeronautics program is to conduct research and develop technology to strengthen U.S. leadership in civil and military aviation. The program is based on a strong commitment to develop a broad technology base in support of the commercial aviation industry, enhance the safety and capacity of the national airspace system, and assure U.S. superiority for national security. With the United States challenged as never before in aeronautics, the FY 1992 funding level reflects the Committee's desire to address critical barriers and strengthen technology development in selected high-payoff areas that are vital to our long-term leadership in aviation.

NASA's aeronautics program is focused on six strategic thrusts: (1) to develop selected, high-leveraged technologies for U.S. subsonic aircraft and to enhance the safety and productivity of the national aviation system; (2) to resolve the critical environmental issues and to establish the technology foundation for economic, high-speed air transportation; (3) to develop technology options for revolutionary new capabilities in future high-performance fixed and rotary wing aircraft; (4) to develop critical technologies for future hypersonic vehicles; (5) to pioneer fundamental research, cross-cutting technology, and the predictive foundation required for advanced systems; and (6) to develop, maintain, and operate critical national facilities for aeronautical research and for support of industry, DOD, and other NASA programs. In accomplishing these goals, the aeronautics program is intended to maintain laboratory strength, including enhanced experimental and computational capabilities and staff excellence; ensure timely domestic technology transfer; ensure strong university involvement; and ensure strong support for and cooperation with the DOD, Federal Aviation Administration, and industry partners.

The Committee continues to support strongly the NASA aeronautical research and technology program as a critical element of the success of the U.S. aerospace industry in the world marketplace. Aerospace is now this country's leading trade surplus industry. Much of this success lies with NASA's work on emerging technologies that are essential in retaining and enhancing that leadership position. Accordingly, the Committee has authorized the full amount requested for FY 1992.

Recognizing the significant potential for any new high-speed commercial aircraft, the Committee supports NASA's continuing research efforts on high-speed aircraft. Regardless of the enormous

economic issues that remain to be resolved, there are several significant environmental concerns, including ozone depletion, sonic boom, and airport noise that threaten to limit future development of high-speed civil transport aircraft. Accordingly, the Committee fully supports NASA's efforts to better understand these environmental issues, as well as its work on advanced technologies as they relate to the high-speed commercial transport.

The Committee supports the administration's multiagency High-Performance Computing and Communications (HPCC) proposal for FY 1992, which follows action last year by the Congress to strengthen NASA's high-performance computing programs. NASA's role in this national program includes acquiring experimental hardware for testbeds and developing software and algorithms in computational aerosciences, Earth and space system sciences, and education network. The goal of NASA's portion of HPCC is to accelerate the development and application of high-performance application of high-performance computing technologies to meet NASA's science and engineering requirements. Given this objective, NASA should consider developing a research program in the computational simulation of aerospace propulsion systems. The United States must improve aerospace propulsion research to maintain world leadership in this vital technology. As in other fields of science, numerical simulation is proving to be scientifically efficient and cost-effective in displacing physical experimentation of complex propulsion systems. Research in the development of numerical propulsion system simulation is clearly needed, together with graduate experimentation in the design, construction, and use of such systems.

Transatmospheric research and technology

The Committee authorizes $72,000,000 for Transatmospheric Research and Technology in FY 1992. This is the same as the President's budget request.

The Transatmospheric Research and Technology Program is a portion of the joint NASA/DOD NASP program. The program objective is to develop and then demonstrate, in an experimental flight vehicle, the technology required to permit the Nation to develop reusable, single-stage-to-orbit vehicles with airbreathing primary propulsion capable of achieving hypersonic velocities (up to Mach 25) using horizontal takeoff and landing on conventional runways.

The NASP program was revised and rescheduled in 1989, based on the President's endorsement of the National Space Council's recommendations to extend the second, current phase of the program, which focuses on technology development. Important work remains on propulsion, materials and structures, controls, and applications of computational fluid dynamics. Emphasis is also placed on integrating these technologies into vehicle concepts to assess both vehicle and technology potential. A decision in the second quarter of FY 1993 will determine whether to proceed to phase 3, which consists of designing, constructing, and flight testing an experimental flight vehicle, the X-30.

While the focus of the NASP program has been restricted to the development of the supporting technologies and the subsequent

design and construction of an experimental vehicle with which to test those technologies, the potential NASP spinoffs may be significant. For example, NASP may eventually emerge as a viable competitor to other launch systems for placing either civil or military payloads in space. NASP indeed may produce significant breakthroughs for the United States in aeronautics; it has the potential to be the next great advance in transportation and could enhance significantly the ability of the United States to compete in future global markets. Accordingly, the Committee has authorized the full $72,000,000 requested in FY 1992 for NASP.

Space research and technology

The Committee authorizes $354,800,000 for Space Research and Technology in FY 1992. This is $67,000,000 less than the President's budget request.

Summary of fiscal year 1992 funding levels

Research and technology base	$141,600,000
Civil space technology initiative program	114,300,000
Space automation and telerobotics	82,900,000
In-space experiments technology program	16,000,000
Total	354,800,000

The overall goal of the space research and technology program is to ensure continued U.S. leadership in space by providing advanced, enabling technologies, validated at a level suitable for user-readiness, for future space missions. To achieve this goal, a broad base of advanced technology is required for vehicle and subsystem concepts, components, devices, and software. This is achieved by developing technical strengths in the engineering disciplines within NASA, industry, and academia and performing critical technology validations that facilitate the transfer of new technology, with a high level of confidence, to future space missions. This program supports five initiatives related to space platforms, space transportation, space science, exploration, and breakthrough technologies.

To accomplish the technology for these initiatives, the Space Research and Technology Program is composed of two complementary parts: the research and technology base program and the focused technology programs. The objective of the research and technology base program is to gain a fuller knowledge and understanding of the fundamental aspects in critical disciplines. The focused technology programs, based on requirements provided by the potential users of the technology, develop technology for specific future applications and deliver products in the form of proven hardware, software, design techniques, and data. The focused programs include (1) the Civil Space Technology Initiative, intended to develop enabling technologies for efficient, reliable access to Earth orbit and increase the effectiveness of science missions in Earth orbit; (2) the Space Automation and Telerobotics Technology Program, which is designed to strengthen the technology base for NASA programs to use automation and robotics to complement and reduce reliance on human presence for certain aspects of space operations; (3) the In-Space Technology Experiments, which will enable development of key flight experiments to provide valuable information for solving critical technology problems.

The reported bill reduces the overall level of funding in the Space Research and Technology Programs by not including the $52,000,000 requested to support the development of Exploration Technologies needed for human exploration of the Moon and Mars, as well as the $15,000,000 requested to conduct Exploration Mission studies. Consistent with action taken in the FY 1991 NASA authorization bill, the Committee has terminated funding for the majority of the President's Space Exploration Initiative Programs. While the Committee supports the concept of future human exploration of the Moon and Mars, funding of those programs intended to support this initiative at this time is not practicable, particularly given current fiscal constraints, and should therefore be deferred to future years.

In the report by the Augustine Committee, great emphasis was placed on the importance of developing space-related technology, as it concluded that "NASA bears part of the responsibility to assure the viability of the technology base upon which to build the missions of the future." The Committee believes that one of those key "enabling technologies" is telerobotics. The reported bill fully funds continued development of the Flight Telerobotic Servicer (FTS), and the $55,000,000 authorized in this bill should be used to complete the FTS Demonstration Test Flight as soon as practicable.

The President's proposed Space Exploration Initiative involves a number of programs spread throughout NASA and other Federal agencies. Tracking NASA budget request intended to support human exploration programs is therefore often difficult. Accordingly, the Committee directs NASA to submit to Congress, at the time of the President's annual budget submission, an itemization of all programs and requested funding levels associated with the Space Exploration Initiative.

Safety, reliability, and quality assurance

The Committee authorizes $33,600,000 for Safety, Reliability, Maintainability, and Quality Assurance (SRM&QA). This represents full funding of the President's budget request and reflects the Committee's support of the critical element of NASA.

Summary of fiscal year 1992 funding levels

Safety, reliability, maintainability and quality assurance	$25,700,000
Applied technologies	7,900,000
Total	33,600,000

The SRM&QA program continues to support actively NASA agencywide goals, through implementation of procedures that reduce program risk and add to safety, reliability, quality assurance, maintainability, systems assessment, and program assurance, including independent assessment and trend analysis activities. Specific program objectives are to: (1) develop and implement top-level NASA safety policies, and define program specific safety requirements; (2) develop an independent mission safety evaluation for each mission, and an independent capability to perform technical assessments to support the SRM&QA decision process; (3) provide technical guidance and support to NASA programs, including shuttle readiness reviews and launch operations; (4) support a risk

management program that provides management visibility into problems and technical risks, and provides analyses and corrective actions; (5) conduct independent quantitative risk assessments, and perform hazard analyses; (6) assure development and maintenance of systems to communicate problems and provide tools which analyze trends and predict and prevent serious problems; (7) review and evaluate NASA and contractor SRM&QA activities to verify conformance with established policies and procedures; (8) upgrade existing software standards, guidebooks, and training, and identify software management product assurance and automated work stations; (9) support industrial, aviation, fire protection, and ground operations safety activities; and (10) foster a total quality management philosophy throughout NASA and its contractors and suppliers.

Tracking and data advanced systems

The Committee authorizes $22,000,000 for Tracking and Data Advanced Systems in FY 1992. This is the same as the President's budget request.

The objective of the Advanced Systems Program is to achieve improved performance and reliability in the areas of tracking and data acquisition for future space missions. The program includes the study, evaluation, and development of new techniques and technologies in telecommunications, microelectronics, and computer sciences for application to space operations. The work is carried to a stage where feasibility is firmly established and further development can be carried out under system implementation. Such effort is essential for the cost-effective introduction of new technology into the Space Network and the Deep Space Network, and for planning the future mission support capabilities. Primary effort in the current Advanced Systems Program is in the areas of data transfer, data processing, communications, orbit and position determination, and expert systems for mission operations.

The Committee supports the Tracking and Data Advanced Systems programs and thus has authorized the full $22,000,000 requested for FY 1992. This program will provide for higher performance tracking and data handling capabilities, which will be needed with the EOS. Efforts to address these requirements and to develop the required technologies to assist in the effective utilization of this data are critical to the success of these programs and should be a high NASA priority.

Academic programs

The Committee authorizes $64,600,000 for the University Space Science and Technology Academic Programs in FY 1992. This is the same as the President's budget request and reflects the Committee's strong support of these programs.

Summary of fiscal year 1992 funding levels

Educational Affairs	$27,600,000
Minority university research	22,000,000
Space grant college and fellowship	15,000,000
Total	64,600,000

NASA's strategy to encourage students to pursue careers in science and engineering is threefold: (1) capture student interest in science and mathematics at an early age, beginning at the elementary level; (2) channel that interest at the secondary, undergraduate, and graduate levels, so that students pursue careers in science, engineering, and technology; and (3) enhance the knowledge, skills, and experiences of precollege teachers and college and university faculty in order to provide the best possible training for tomorrow's civil servants, aerospace contractors, and university researchers. NASA's academic programs capture the elementary student's interest in science and mathematics through "spacemobiles," visits to school assemblies, and other outreach activities that take advantage of a child's natural excitement in space exploration. Channeling that natural interest into science and engineering career paths is accomplished through internships, undergraduate fellowships, and other programs that provide talented students with intellectual and financial support to keep progressing through the educational system, all the way up to Ph.D. level.

Space flight, control, and data communications

Section 101(b) authorizes appropriations to NASA to become available October 1, 1991, for "Space flight, control, and data communications." This subsection authorizes a total of $5,535,300,000 for FY 1992 activities, including funds for space shuttle production and operational capability ($1,338,900,000), space transportation operations ($2,945,600,000), ELVs ($329,900,000), and space and ground network, communications, and data systems ($920,900,000).

DISCUSSION OF SPECIFIC AUTHORIZATIONS

The reported bill reflects the Committee's continuing strong support for a safe and reliable space transportation system, by providing a total of $5,535,300,000 in FY 1992 for the sustained development and operation of the Space Shuttle Program, continued use of ELVs, and tracking, telemetry, command, and data acquisition support for all NASA flight projects using ground-based and satellite components.

Space shuttle production and operational capability

The Committee bill authorizes $1,338,900,000 for Space Shuttle Production and Operational Capability in FY 1992. This is $50,000,000 above the President's budget request and reflects a strong desire to maintain the safety and reliability of the Nation's space transportation system. Of the total amount authorized, the bill specifically provides that $375,000,000 shall be made available for the ASRM program.

Summary of fiscal year 1992 funding levels

Orbiter operational capability	$273,800,000
Propulsion systems	672,700,000
Assured shuttle availability	122,300,000
Launch and mission support	270,100,000
Total	1,338,900,000

This program provides necessary design modifications and safety improvements to support the space shuttle; needed capabilities at the launch site and for the flight operations process; continued development and testing of propulsion systems; and replacement of obsolete systems to ensure the long-term viability of the Shuttle Program.

With the loss of Challenger in January 1986, the orbiter fleet was reduced to three vehicles. The current orbiter fleet includes Columbia, the orbiter developed and flown on four test and evaluation flights, and two orbiters of a lighter weight configuration, Discovery and Atlantis. A fourth orbiter, Endeavor, has been delivered and is now being readied for its maiden flight later this year. This budget account provides funding for necessary improvements, hardware fixes, and mission kits for the orbiter fleet to satisfy flight requirements. The Extended Duration Orbiter development is also included to increase on-orbit stay time from 7–10 days to 14–16 days. This Orbiter will improve Shuttle capability to support an increased variety of payload requirements.

The reported bill includes a funding level for Propulsion Systems $50,000,000 higher than the President's request. This reflects the transfer of that amount from the Construction of Facilities account to support continued development of the ASRM. The Committee believes that the ASRM is critical to the safety and reliability of the total space shuttle system, as the increased performance that is expected will improve the space shuttle's margin of safety while greatly enhancing its ability to carry payloads to low Earth orbit. NASA has testified that in order to meet its current target date of December 1996, for the first launch of a space shuttle with the ASRM, expected to be the sixth Space Station assembly flight, an FY 1992 authorization of $375,000,000 is needed. By transferring these funds and authorizing that entire amount, the Committee is expressing its commitment to this program and the importance of maintaining the planned ASRM development schedule. Due to limited Federal resources, the Committee expects NASA to absorb the remaining ASRM development costs incurred in FY 1992.

Space transportation operations

The Committee authorizes $2,945,600,000 for Space Transportation Operations in FY 1992. This is a reduction of $78,000,000 from the President's request.

Summary of fiscal year 1992 funding levels

Flight operations	$834,500,000
Flight hardware	1,417,000,000
Launch and landing operations	694,100,000
Total	2,945,600,000

Space Transportation Operation provides for space shuttle launch services for NASA payloads and, on a reimbursable basis, to DOD, other civil agencies, and certain commercial and international users. The major program elements of Shuttle Operations are (1) Flight Operations, including mission operations, integration, and support; (2) Flight Hardware, which provides for the procurement of external tanks and solid rocket boosters, orbiter logistics sup-

port, replenishment of spare parts inventory for the orbiter, and Space Shuttle Main Engine component repairs and overhauls; and (3) Launch and Landing Operations, which provides for the prelaunch preparation, liquid propellants and gases, and launch and landing operations of the space shuttle.

The Committee has made two changes to the President's FY 1992 request for Space Transportation Operations. First, the Committee agrees with the House on the need for NASA to achieve costsavings in the Space Shuttle Program, provided such cost reduction does not come at the expense of quality and safety. The Committee supports a first-year improvement in space shuttle efficiency of 3 to 5 percent, resulting in a savings of approximately $39,000,000 in FY 1992.

Second, in recognition of the need to limit unnecessary expenditures, the reported bill assumes the launch of the next Tracking and Data Relay (TDRS–G) satellite aboard the space shuttle, rather than on an (ELV). In its original budget submission to OMB, NASA had proposed launching this payload on the space shuttle. It is the Committee's understanding that OMB shifted the TDRS–G to an ELV in an effort to comply with the recommendations made by the Augustine Committee which concluded that every effort must be made to offload those satellites that do not need the unique capabilities of the shuttle. However, in light of the fact that launch of this payload aboard the Space Shuttle will result in FY 1992 savings of $39,000,000, the Committee recommends that NASA consider actions which result in reduced Federal expenditures.

The Augustine Committee made a number of important recommendations affecting the internal management of NASA. Of particular importance was the need to reassess the current practice of administering the Space Shuttle and Space Station Program by a single individual, the Associate Administrator for the Office of Space Flight. Recognizing that these two activities represent 47 percent of the NASA budget, the Augustine Committee proposed that NASA take action to separate space shuttle and Space Station operational activities from developmental activities, creating two separate Associate Administrator positions to oversee each respective area. The Committee agrees with this recommendation and very strongly urges NASA to implement this recommendation as expeditiously as possible.

Expendable launch vehicles

The Committee authorizes $329,900,000 for NASA'S ELV program for FY 1992. This is a reduction of $12,000,000 from the President's request, and reflect reduced costs to NASA for the procurement of a Titan IV launch vehicle.

The ELV program provides a mixed fleet capability, which in conjunction with the space shuttle, satisfies NASA's payload requirements. As a part of NASA's launch recovery strategy following the Challenger accident in 1986, several scientific spacecraft configured for the Shuttle were transitioned to ELVs. All subsequent ELV launch services are being acquired by NASA competitively from the private sector, whenever available, to launch civil government payloads in three performance classes: (1) small class, capable of launching payloads up to 1,000 pounds in low Earth

orbit; (2) medium class, capable of launching payloads up to 10,000 pounds; and (3) intermediate class capable of launching payloads up to 30,000 pounds. Large class missions with payloads up to 40,000 pounds to low Earth orbit must be acquired from DOD.

The Committee concurs with NASA's request for continued funding for the FY 1992 portion for the launch vehicle for the mobile communications satellite (MSAT), as planned by the American Mobile Satellite Corporation (AMSC). The Committee notes the longstanding commitment by NASA to AMSC, as the first MSAT licensee, and agrees with the plan in which NASA, by providing partial launch vehicle cost support, will be entitled to a portion of the satellite's capacity, which NASA is offering to Federal, State, and local governmental agencies for both experimental and operational purposes. In authorizing these funds, the Committee intends that these funds will not be used to procure a foreign launch vehicle for the launch of MSAT. Existing U.S. launch policy calls for U.S. funds to support the U.S. commercial launch industry.

In continuing the funding for MSAT, the Committee recognizes the importance for the United States to remain on the cutting edge of advanced mobile cellular communications technology. Failure to fund the MSAT program will widen an already increasing technology gap, which will be filled rapidly by foreign interests at the expense of the United States. The MSAT system will ensure that mobile cellular service is available in those geographically remote areas of the country, primarily rural areas, which will not be able to obtain such service from terrestrial-based cellular systems. It also will enable emergency communications response in the event of natural and human disasters.

The Committee notes the recent Court of Appeals decision in which certain procedures used by the Federal Communications Commission (FCC) in granting the MSAT license to the AMSC consortium were called into question. The Committee's decision to continue NASA support for MSAT should be seen by the FCC as a firm commitment to the full development of this system. The FCC should proceed in a timely manner to meet the demands of the court's decision in an effort to avoid further costly delays.

Space and ground networks, communications, and data systems

The Committee authorizes $920,900,000 for Space Ground Networks, Communications, and Data Systems in FY 1992. This represents a general reduction of $33,000,000 from the President's budget request, which NASA may absorb by eliminating payment to the Federal Financing Bank for the Tracking and Data Relay Satellite System (TDRSS).

Summary of fiscal year 1992 funding levels

Space network*	$348,000,000
Ground networks	291,700,000
Communications and data systems	314,200,000
Total	[1] 920,000,000

[1] Assumes a general reduction of $33,000,000 to be taken at NASA's discretion.

The purpose of the Space Tracking and Data Acquisition Program is to provide vital tracking, telemetry, command, data acqui-

sition, communications, and data processing support to meet the requirements of all NASA flight projects. In addition to NASA flight projects, support is provided on a reimbursable basis for other Government agencies, commercial firms, and international organizations.

Support is provided for Earth orbital, planetary, and solar system exploration spacecraft missions, launch vehicles, research aircraft, sounding rockets, and balloons. Included in the Earth orbital activities are the space shuttle, spacelabs, and scientific and applications missions.

NASA has three separate tracking networks to meet the requirements of all classes of NASA flight missions. These are: (1) the Spaceflight Tracking and Data Network, for all high Earth orbital missions and Shuttle launch and landing operations; (2) the Deep Space Network, for planetary and interplanetary flight missions; and (3) the Space Network, which includes the TDRSS, required by most low Earth orbital missions.

Highly specialized computation facilities provide real-time information for mission control and data processing of the scientific, applications, and engineering data which flow from flight projects. In addition, instrumentation facilities provide support for sounding rocket and balloon launchings and flight testing of aeronautical research aircraft.

CONSTRUCTION OF FACILITIES

Section 101(c) authorizes appropriations to NASA to become available October 1, 1991 for "Construction of facilities," including land acquisitions. This subsection authorizes a total of $430,300,000 for a variety of repair, rehabilitation, and new construction activities required to support the civilian space program. The reported bill differs from the President's request in that it transfers $50,000,000 from the Construction of Facilities account to Space Flight, Control, and Data Communications programs to support continued development of the ASRM.

This subsection in paragraph (1) through (31) provides for the following authorization amounts.

Summary of fiscal year 1992 funding levels

(1) Construction of Space Station Processing Facility, Kennedy Space Center	$35,000,000
(2) Modification for Earthquake Protection, Downey/Palmdale, California, Johnson Space Center	4,400,000
(3) Modifications for Safe Haven, Vehicle Assembly Building, High-Bay 2, Kennedy Space Center	7,500,000
(4) Rehabilitation of Crawlerway, Kennedy Space Center	3,000,000
(5) Restoration of Shuttle Landing Facility Shoulders, Kennedy Space Center	4,000,000
(6) Restoration of the High Pressure Gas Facility, Stennis Space Center	6,500,000
(7) Construction of Addition for Flight Training and Operations, Johnson Space Center	13,000,000
(8) Construction of Advanced Solid Rocket Motor Program Facilities (various locations)	100,000,000
(9) Modernization of Industrial Area Chilled Water System, Kennedy Space Center	4,000,000
(10) Rehabilitation and Expansion of Communications Duct Banks, Kennedy Space Center	1,400,000

(11) Replacement of 15 KV Load Break Switches, Kennedy Space Center	1,300,000
(12) Repair of Site Water System, White Sands Test Facility	1,300,000
(13) Replacement of Central Plant Chillers and Boiler, Johnson Space Center	5,700,000
(14) Modifications to X-Ray Calibration Facility (XRCF), Marshall Space Flight Center	5,200,000
(15) Restoration and Modernization of High Voltage Distribution System, Goddard Space Flight Center	7,000,000
(16) Construction of Earth Observing System Data Information System Facility, Goddard Space Flight Center	17,000,000
(17) Modernization of Main Electrical Substation, Jet Propulsion Laboratory	5,500,000
(18) Restoration of Utilities, Wallops Flight Facility	3,500,000
(19) Repair and Modernization of the 12-foot Pressure Wind Tunnel, Ames Research Center	25,000,000
(20) Upgrade of Outdoor Aerodynamic Research Facility, Ames Research Center	3,300,000
(21) Modernization of 16-foot Transonic Tunnel, Langley Research Center	3,400,000
(22) Modifications to the High Pressure Air System, Langley Research Center	11,700,000
(23) Rehabilitation of Central Air System, Lewis Research Center	5,600,000
(24) Rehabilitation of Icing Research Tunnel, Lewis Research Center	2,600,000
(25) Construction of Data Interface Facility, White Sands Test Facility	4,000,000
(26) Rehabilitation of Tracking and Data Relay Satellite System Ground Terminal, White Sands Test Facility	5,700,000
(27) Repair of facilities at various locations, not in excess of $1,000,000 per project	31,700,000
(28) Rehabilitation and modification of facilities at various locations, not in excess of $1,000,000 per project	34,800,000
(29) Minor construction of new facilities and additions to existing facilities at various locations, not in excess of $750,000 per project	12,900,000
(30) Environmental compliance and restoration	36,000,000
(31) Facility planning and design, not otherwise provided for	34,000,000

The reported bill further provides that notwithstanding these amounts, the total amount authorized by this subsection shall not exceed $430,300,000.

The Construction of Facilities authorization provides contractual services for the repair, rehabilitation, and modification of existing facilities; the construction of new facilities and the acquisition of related facility equipment; environmental compliance activities; the design of facilities projects; and advanced planning related to future facilities needs.

The funds requested for FY 1992 provide for continuing prior year endeavors to meet facilities requirements for the Space Station Freedom and Space Flight Programs; construction of new facilities needed to support science, space technology, and aeronautical research; repair, rehabilitation, and modification of other facilities to maintain, upgrade, and improve the usefulness of the NASA physical plant; minor construction of new facilities, facility planning and design activities, and environmental compliance and restoration.

The FY 1992 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensuring safe, economical, and efficient use of the NASA physical plant. This bill continues the necessary rehabilitation and modification program begun in prior years and continues

a responsive repair program. The repair program restores facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements. The environmental compliance and restoration program ensures that statutory environmental requirements are met and that any necessary remedial actions are taken promptly.

RESEARCH AND PROGRAM MANAGEMENT

Section 101(d) authorizes appropriations to NASA to become available October 1, 1991, for "Research and program management." This subsection authorizes a total of $2,432,300,000 for all civil service staff, maintenance of facilities, and support of research and development programs and contract activities, as well as technical and administrative support of research and development programs. The reported bill assumes a general reduction in the President's request for FY 1992 of $20,000,000, to be taken from whichever of NASA's programs it chooses.

Summary of fiscal year 1992 funding levels

Personnel and related costs	$1,512,522,000
Travel	54,056,000
Operation of installation	885,722,000
Total	[1] 2,432,300,000

[1] Assumes a general reduction of $20,000,000 to be taken at NASA's discretion.

NASA's Research and Program Management account provides funds for its civil service workforce, for both salaries and the essential support without which they could not function. It provides for total support of those buildings and facilities that are basically administrative in function. It also provides a considerable amount of direct support to NASA's Research and Development programs and activities. Beginning in FY 1992, this account will provide for the performance by civil servants of a number of functions that had been performed previously by contractors and funded by other appropriations. The reported bill provides funding for the conversion of slightly over 1,000 of such positions (595 full-time equivalents) to civil servants.

INSPECTOR GENERAL

Section 101(e) authorizes appropriations to NASA to become available October 1, 1991, for "Inspector General." This subsection authorizes a total of $14,600,000 to support the activities of the Office of the Inspector General of NASA. The reported bill is the same of the President's request for FY 1992, and reflects the Committee's strong support of the NASA Inspector General's Office.

The NASA Office of Inspector General was created by the Inspector General Act of 1978 (P.L. 95-452), as amended, as an independent and objective unit within NASA to: conduct audits and investigations of NASA's programs and operations; promote economy, efficiency, and effectiveness in the administration of programs and operations; and keep the Administrator and Congress fully and currently informed about NASA programs, deficiencies relating to the

administration of such programs, and the necessity for and progress of corrective actions.

OTHER PROVISIONS

Section 101(f) authorizes the Administrator, notwithstanding the provisions of subsection (i), to use appropriations made to "Research and Development" and "Space flight, control, and data communications" (1) for any items of a capital nature, other than acquisition of land, which may be required at locations other than NASA installations for the performance of research and development contracts, and (2) for grants to nonprofit institutions of higher education, or to nonprofit organizations whose primary purpose is the conduct of scientific research, for the purchase or construction of additional research facilities. Title to such facilities must be vested in the United States unless the Administrator determines that the national program of aeronautical and space activities will be served best by vesting title in the grantee institution or organization.

Each grant made under this subsection shall be made under conditions determined by the Administrator as necessary to ensure that the United States will receive adequate benefit to justify making that grant. None of the funds appropriated for "Research and development" and "Space flight, control, and data communications" pursuant to this legislation may be used in accordance with this subsection for the construction of any major facility if the estimated cost of that facility, including collateral equipment, exceeds $750,000, unless the Administrator has notified the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives of the nature, location, and estimated cost of such facility.

Section 101(g) states that (1) any amount appropriated pursuant to this Act for "Research and development," for "Space flight, control, and data communications," or for "Construction of facilities" may remain available until expended, and (2) any amount appropriated pursuant to this legislation for "Research and program management" for maintenance and operation of facilities and other services shall remain available through the next fiscal year following the fiscal year for which such amount is appropriated.

Section 101(h) authorizes the use of appropriations made pursuant to subsection (d), but not to exceed $35,000, for scientific consultations or extraordinary expenses upon the approval or authority of the Administrator, and provides further that the Administrator's determination shall be final and conclusive upon the accounting officers of the Federal Government.

Section 101(i)(1) authorizes the use of funds appropriated pursuant to subsections (a), (b), and (d), for the construction of new facilities and additions to, repair of, rehabilitation of, or modification of existing facilities, except that the cost of each such project, including collateral equipment, shall not exceed $200,000.

Section 101(i)(2) authorizes the use of funds appropriated under subsections (a) and (b) for unforseen programmatic facility project

needs, except that the cost of each such project, including collateral equipment, shall not exceed $750,000.

Section 101(i)(3) authorizes the use of funds appropriated pursuant to subsection (d) for repair, rehabilitation, or modification of facilities controlled by the General Services Administration, except that the cost of each project, including collateral equipment, shall not exceed $500,000.

Section 101(j) amends section 103(a)(1)(S)(i) of the National Aeronautics and Space Administration Authorization Act, Fiscal Year 1991 (P.L. 101-611; 104 Stat 3192), by striking "$490,000,000" and inserting in lieu thereof "$425,000,000". This provision is necessary to reduce prior year authorization levels for the CRAF/Cassini program to reflect funding reductions in the reported bill to the CRAF program.

SECTION 102—CONSTRUCTION OF FACILITIES REPROGRAMMING

Section 102 authorizes the Administrator (1) to vary the amounts prescribed for specific projects identified in section 101(c) (1) through (31) upward by 10 percent, or (2) in order to meet unusual cost variations, to vary such amount upward by 25 percent, following a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives. The total cost of all construction work authorized under paragraphs (1) and (2) of this subsection shall not exceed the total amounts specified in section 101(c).

SECTION 103—SPECIAL REPROGRAMMING AUTHORITY FOR CONSTRUCTION OF FACILTIES

Section 103 authorizes the Administrator to transfer an amount not to exceed one-half of 1 percent of the funds appropriated pursuant to section 101 (a) and (b) to the "Construction of facilties" appropriation account if the Administrator determines that new development or scientific or engineering changes in the national program of aeronautical and space activities have occurred, and that such changes require the use of additional funds for the purposes of construction, expansion, or modification of facilties at any locations, and that deferral of such action until enactment of the next NASA authorization act would be inconsistent with the interest of the Nation in aeronautical and space activities. The Administrator also may use up to $10,000,000 of the amounts authorized under section 101(c) for such purposes. The funds made available pursuant to this section may be expended to acquire, construct, convert, rehabilitate, or install permanent or temporary public works, including land acquisition, site preparation, appurtenances, utilities, and equipment. No such funds may be obligated until a period of 30 days has passed after the Administrator or the Administrator's designee has transmitted a written report describing the nature of the construction, its cost, and the reasons for the project to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives.

SECTION 104—CONSIDERATION BY COMMITTEES

Section 104 provides that notwithstanding any other provision of this legislation (1) no amount pursuant to this legislation may be used for any program deleted by the Congress from requests as originally made to either the Senate Committee on Commerce, Science, and Transportation of the Senate or the Committee on Science, Space, and Technology of the House of Representatives; (2) no amount appropriated pursuant to this legislation may be used for any program in excess of the amount actually authorized for that particular program by section 101 (a), (b), and (d); and (3) no amount appropriated pursuant to this legislation may be used for any program which has not been presented to either such Committee, unless a period of 30 days has passed after the receipt, by each such committee, of notice given by the Administrator or the Administrator's designee containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of such proposed action. NASA is directed to keep the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives fully and currently informed with respect to all activities and responsibilities within the jurisdiction of those committees. This section further directs any Federal Department, Agency, or independent establishment to furnish any information requested by either committee relating to any such activity or responsibility.

SECTION 105—GEOGRAPHICAL DISTRIBUTION

Section 105 expresses the sense of Congress that it is in the national interest that consideration be given to geographical distribution of Federal research funds whenever feasible. The Committee has a continuing concern that NASA ensure a broader distribution of both its research and development funds. This concern arises not only because the Committee believes that meritorious research ought to be broadly encouraged, but also because the key to developing a broadly based science and engineering education program is the assembly of a critical mass of talented researchers and educators in key locations throughout the country. This is especially important since, according to the Office of Science and Technology Policy, 45 percent of college and university students attend school within 50 miles of their home.

NASA is attempting to address this issue through Phase II of the Space Grant College and Fellowship Program. While NASA is to be commended for this initiative, particularly as it begins to address the infrastructure and fellowship needs of States which have not been successful in participating in NASA programs, the Committee remains concerned that a future effort is required to link improvements in research capabilities to this ongoing program.

As the recent Office of Technology Assessment report "Federally Funded Research: Decisions for a Decade" notes, "regional and institutional capacity are important concerns in all Federal funding, and encouraging new institutional participants and the development of research centers strengthens the future capacity and diversity of the research system." The report recommends that the Na-

tional Science Foundation (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR) serve as a model for such initiatives and the Committee supports that recommendation. Accordingly, the Committee directs NASA to propose a plan fashioned along the lines of the EPSCoR program within NSF which would strengthen the ability of academic institutions in EPSCoR states to complete for NASA research funding. Cost estimates should be included in this plan, which is to be submitted to the Committee by January 1, 1992.

SECTION 106—PEACEFUL USES OF SPACE STATION

Section 106 states that no civil space station authorized under section 101(a)(1) of this legislation may be used to carry or place in orbit any nuclear weapon or any weapon on any celestial body, or to station any such weapon in space in any other manner. This civil space station only may be used for peaceful purposes.

This section reiterates the past Committee position. It is consistent with existing U.S. treaty obligations (the Outer Space Treaty) and provisions established in the FY 1989 NASA Authorization Act (P.L. 100-685).

SECTION 107—POLICY USE OF FOREIGN LAUNCH CAPABILITIES

Section 107 expresses the sense of Congress that the United States should maintain the current launch capabilities which prohibit the use of foreign launch capabilities for U.S. Government satellites. The U.S. Commercial Space Launch Policy, issued on September 5, 1990, states that "U.S. Government satellites will be launched on U.S. manufactured launch vehicles unless specifically exempted by the President." The Committee strongly supports this policy. Adherence to the policy is important as the U.S. Trade Representative (USTR) and the ESA are currently involved in negotiations to establish "rules of the road" for the launch industry. The Committee expects the USTR to follow current policy in the context of these and future negotiations.

SECTION 108—TRANSMISSION OF BUDGET ESTIMATES

Section 108 directs the Administrator to transmit to the Congress, at the time of submission of the President's annual budget, (1) a 5-year budget detailing the estimated development costs for each major program under NASA's jurisdiction; and (2) an estimate of the life-cycle costs associated with each major project, mission, and program. The Committee strongly believes that as Congress and the President continue to strive to control growth in the Federal deficit, it is imperative that there is a complete understanding of the total cost of every program, project, and mission that NASA proposes. Throughout hearings on the NASA authorization bill, a recurring theme expressed by Committee members was the need to understand how decisions made today affect the budgetary environment in the coming years. Most, if not all NASA programs, have funding profiles with relatively low resource needs in their early years. However, these same programs typically assume substantial growth as they develop and mature. Without knowing what the long-term funding "wedge" each project, mission, and program will

represent, Congress cannot determine adequately the appropriate priorities for our civil space program within the limited Federal budget. This measure, which was endorsed in principle by the Chairman of the Augustine Committee, is intended to provide additional information in order that the Committee can evaluate each project, mission, and program within the limited resources expected to be available for NASA in the future, ensuring that actions taken to fund certain programs do not preclude support for higher priority programs.

With this in mind, the Committee strongly endorses the recommendation of the Augustine Committee that NASA establish an independent cost analysis function with the ultimate responsibility for all top-level cost estimating. The Committee notes that NASA has announced the Administrator's intent to "significantly augment the independent cost capability recently initiated by the NASA Comptroller." There is a real need to create independence for this important function. Likewise, there is an important need for Congress to have access to such independent cost estimates in order to make decisions that are in NASA's long-term interest, as well as the interest of the Nation. Accordingly, NASA is urged to explore alternative means of establishing an independent cost analysis capability that can serve both the Administrator and Congress.

TITLE II—COMMERCIAL SPACE LAUNCH ACT

SECTION 201—AUTHORIZATION FOR SECRETARY OF TRANSPORTATION

Section 201 authorizes $5,104,000 to be appropriated in FY 1992 to the Secretary of Transportation (Secretary) to carry out the activities of the OCST and to fulfill the Secretary's responsibilities pursuant to the Commercial Space Launch Act (49 App. U.S.C. 2623). This is the same as was requested in the President's FY 1992 budget. The OCST was established pursuant to the Commercial Space Launch Act (P.L. 100–575), with the purposes of establishing and enforcing the licensing and regulatory regime for U.S. commercial launch activities, and encouraging, facilitating, and promoting U.S. commercial space launches by the private sector. The OCST has also played a pivotal role in promoting a favorable regulatory environment for the growth of the fledgling U.S. commercial launch industry.

To ensure proper and thorough review of license applications, the Committee supports the OCST FY 1992 budget request. Adequate resources to oversee and regulate properly the commercial ELV industry are essential to ensure that the United States can fulfill its obligations under international treaties, as well as to protect fully the health and safety of the public.

There is growing concern and interest in improving the current condition of the Nation's space transportation infrastructure. Improving and expanding this infrastructure will improve range safety, alleviate congestion, and advance launch technologies, in addition to improving the Nation's position in the international space launch marketplace. As such, the Committee will continue to monitor the condition of our space launch infrastructure, and will consider possible means of making necessary improvements.

TITLE III—NATIONAL SPACE COUNCIL

SECTION 301—COUNCIL AUTHORIZATION

Section 301 authorizes $1,491,000 to be appropriated in FY 1992 to carry out the activities of the National Space Council, established pursuant to the NASA Authorization Act, FY 1989 (42 U.S.C. 2471). This is the same as the President's request for FY 1992.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

COMMERCIAL SPACE LAUNCH ACT

Section 24 of that Act

[AUTHORIZED APPROPRIATIONS

[There are authorized to be appropriated to the Secretary $4,000,000 for fiscal year 1985. There is authorized to be appropriated to the Secretary to carry out this Act $586,000 for fiscal year 1986. There is authorized to be appropriated to the Secretary to carry out this Act $4,548,000 for fiscal year 1988. There is authorized to be appropriated to the Secretary to carry out this Act $3,827,000 for fiscal year 1989. There are authorized to be appropriated to the Secretary to carry out this Act $4,517,000 for fiscal year 1991, of which $250,000 shall be made available for the provision of launch services for eligible satellites in accordance with section 6 of the Commercial Space Launch Act Amendments of 1988.]

AUTHORIZED APPROPRIATIONS

SEC. 24. There is authorized to be appropriated to the Secretary to carry out this Act $5,104,000 for fiscal year 1992. Sums appropriated for research and development shall remain available until expended.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ACT, FISCAL YEAR 1991

Section 103 of that Act

SEC. 103. AUTHORIZATION OF APPROPRIATIONS.

(a) AUTHORIZATIONS.—There are authorized to be appropriated to the National Aeronautics and Space Administration the following amounts:

(1) For "research and development", for the following programs:

(A) through (R) * * *

(S) Comet Rendezvous Asteroid Flyby/Cassini mission, not to exceed $1,600,000,000, for development, launch, and

30 days of operations thereof, to remain available until expended, of which—

(i) [$490,000,000] $425,000,000 shall be available for obligation after October 1, 1989;

(ii) through (iv) * * *

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(2) through (5) * * *

(b) * * *

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